PHONOLOGICAL AWARENESS INSTRUCTION FOR MIDDLE SCHOOL STUDENTS WITH READING PROBLEMS

BY

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
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Two decades of research on phonological awareness intervention support the idea that phonological awareness skills are crucial to reading success. The present study aimed to build on existing research by extending previous research findings to older students who have deficits in phonological awareness. The purpose of the study was to determine if older students (at the middle school level) who were identified as having phonological awareness deficits could improve their phonological awareness skills after instruction, and if these skills could impact their word recognition.

Forty middle school students with learning disabilities who were identified as having phonological awareness deficits were matched and split into two groups, A and B. After both groups received the pretest, group A began intervention. After group A completed intervention, both groups were given a midtest. At this point, group B began instruction. After group B completed instruction, both groups were given the posttest. Both groups received the same type of phonological awareness instruction.

Results of the ANOVA indicated that for the word identification subtest, there was no group effect. However, there was main effect for occasion; that is, for both groups, posttest scores were significantly higher than the midtest scores, and midtest scores were significantly higher than the pretest scores. With respect to the CTOPP scores, results indicated an interaction effect. Follow-up t-tests indicated that for the midtest, group A significantly outperformed group B on the CTOPP. This implied that the intervention did have an effect for phonological awareness. Further, for group A, the posttest score on the CTOPP was not significantly different from the midtest score, indicating that group A showed maintenance on the posttest. Both groups also had significantly higher posttest scores compared to the pretest scores, implying that both groups improved on phonological awareness skills over time.

Results of this study suggest that older students who have deficits in phonological awareness are capable of improving these skills after instruction. This finding is promising, considering the fact that the participants in this study were far below grade level at the beginning of the study. However, it is difficult to make conclusions about the impact of phonological awareness on word identification skills.

Implications for research include designing interventions for older students to determine the optimal duration and intensity of instruction that would facilitate transfer of phonological awareness skills to word recognition. In addition, longitudinal experimental studies involving older students would be informative regarding the benefits of phonological awareness instruction for word identification.

CHAPTER I
INTRODUCTION TO THE PROBLEM

Introduction

Learning to read is crucial for academic success. Reading is an integral part of every school's curriculum, and all content areas require children to be able to read and process information. Children who learn to read tend to do well in academics, because their comprehension is facilitated, thus increasing their knowledge base. This increase in knowledge base may prompt children to learn more information, thus enhancing their reading skills.

Reading skills continue to develop as children grow older. Thus, learning to read is not an isolated event; rather it is a process that begins when a child is an infant and continues throughout school (Jenkins & Bowen, 1994). During the early literacy stages, it is important for children to develop several skills as prerequisites for reading. One of the most vital skills that children need to develop is phonological awareness (Adams, 1990; Liberman & Liberman, 1990; Wagner & Torgesen, 1987). Phonological awareness refers to an individual's awareness that spoken words consist of sound segments smaller than the syllable (Ball, 1997).

Experimental evidence clearly indicates that phonological awareness is a critical prerequisite for learning to read (Juel, 1988; Juel, Griffith, & Gough, 1986; Tunrner, Herriman, & Nesdale, 1988). Phonological awareness helps children to map sounds

onto symbols and to break words into their individual sounds. Mapping sounds to symbols and being aware that words are made up of individual units are crucial prerequisite skills for learning to read (Adams, 1990; Jenkins & Bowen, 1994). Phonological awareness has received much attention because of its strong, consistent, and positive correlation with word recognition (Adams, 1990; Juel, 1988; Tunmer et al., 1988). Children who demonstrate a high level of phonological awareness are usually the same children who recognize printed words accurately and rapidly, and thus become good readers. Findings are fairly consistent that young children with a high level of phonological awareness are likely to be the better readers in first and second grades (Juel, 1988; Juel, Griffith, & Gough, 1986; Tunmer, Herriman, & Nesdale, 1988).

Because phonological awareness has a strong correlation with reading success, it would seem evident that deficits in phonological awareness should be linked to reading problems. In fact, research has pointed out that children who have difficulties in reading words often display phonological deficits (Frith, 1981; Torgesen, 1985). For those children with phonological deficits, learning phonological awareness skills (such as blending and segmenting) presents a challenge. The problems children with reading disorders have in processing phonological information make learning sound and letter associations very difficult (Jenkins & Bowen, 1994). Difficulties in associating letter and sound could limit the ability to understand the phonological structure of words, and, hence, contribute to difficulty with word recognition (Stanovich & Siegel, 1994).

Because research has established that phonological awareness is crucial to decoding and word recognition, much attention has been devoted to the training of phonological awareness in children with deficits in phonological awareness. Among the

many researchers who have investigated the effectiveness of explicitly training phonological awareness, several investigators have developed interventions that can be adapted for use with children in kindergarten and first grade (Ball & Blachman, 1988, 1991; Bradley & Bryant, 1983; Cunningham, 1990; Lundberg, Frost, & Peterson, 1988; Olofsson & Lundberg, 1983, 1985).

Researchers have explored a variety of intervention models (i.e., whole class, small group, or one-to-one instruction), varying the duration of the intervention and the choice of activities. Some studies focused on rhyme training alone (e.g., Layton, Deeny, Tall, & Upton, 1996), while others focused on blending and segmenting. Some training studies provided blending and segmenting instruction at the onset and rime level (e.g., O'Connor, Jenkins, Leicester, & Slocum, 1993; O'Connor, Slocum, & Jenkins, 1995; Slocum, O'Connor, & Jenkins, 1993), while others provided blending and segmenting instruction at the phoneme level (e.g., Hurford et al., 1994; Torgesen, Morgan, & Davis, 1992; Williams, 1980).

All the studies on phonological awareness training provide evidence that phonological awareness can be taught and that children who have deficits in phonological awareness benefit from such instruction. Children who were trained in phonological awareness showed improvement in phonological awareness skills such as blending and segmenting phonemes. These children also showed improvements in reading words and spelling. Those training studies that involved a follow-up component showed evidence that phonological awareness skills tend to be maintained over an extended period of time (6 to 8 months) (e.g., Lundberg, Frost, & Peterson, 1988; McGuinness, McGuinness, & Donohue, 1995).

These research-based findings have important implications for children who have reading problems and those who are at-risk. However, one limitation of these findings is that they may not be generalizable to all children who have reading problems. Almost all the landmark studies on phonological awareness training have focused on only one population, elementary school students. Thus, a large gap exists in the literature with respect to training studies for older students who have phonological deficits. Despite years of basic skill instruction (at the elementary school level), there are still students in the middle school and high school level who experience reading difficulties (Deshler, Warner, Schumaker, & Alley, 1983). Reading problems could prevent students from progressing academically and learning higher order skills. Further, instruction in the middle and high school level rarely focuses on acquisition of basic skills (Juel, 1988). Lack of appropriate instruction and increasing academic demands placed on older students may prevent these students from enhancing their reading skills. In order to catch up with their peers, older students who experience reading difficulties need appropriate instruction to develop skills that are basic to reading.

Rationale for the Study

The research on phonological awareness has provided experimental evidence that phonological awareness is a necessary skill in learning to read (Ball & Blachman, 1991; Lundberg, Frost, & Peterson, 1988; Torgesen, Morgan, & Davis, 1992). Furthermore, research has also proved that children with decoding problems and phonological deficits are capable of learning phonological awareness skills and applying them to the process of decoding words (e.g., Bradley & Bryant, 1985; O'Connor, Jenkins, Leicester, & Slocum, 1993; Torgesen, Morgan, & Davis, 1992). Despite this large body of research on

phonological awareness training, there have been very few intervention studies involving older students who have decoding problems (e.g., Williams, 1980; Vellutino & Scanlon, 1987). This older population of students seems to have been ignored, despite the fact that there are students in the middle and high school level who have decoding problems (Reith & Polsgrove, 1994). The next logical step in this area of research is to design an appropriate phonological awareness intervention program for older students who have decoding problems, and to determine if the intervention facilitates their word recognition and decoding skills. Suitable intervention programs for older students are needed because most instruction in the middle and high school level involves enhancing higher order skills (Juel, 1988). Consequently, older students who have decoding problems have no opportunity to develop those skills that are necessary for word recognition (i.e., phonological awareness skills).

One of the purposes of this study was to determine the effects of instruction in phonological awareness for students in the middle school level who were identified as having phonological deficits. The instruction was designed to target specifically phonological awareness skills such as blending, segmenting, deletion, and reversal of phonemes. Thus, we needed to determine if these students' phonological awareness skills improved after instruction. The second purpose of this study was to find out if these phonological awareness skills facilitated the students' word identification skills.

The training was based on the theoretical model as espoused by Adams (1990). According to Adams' model, four processors are interrelated during the process of reading: the orthographic processor, the phonological processor, the meaning processor, and context processor. This study focused on strengthening the phonological processor:

the processor that is directly responsible for translating symbols into sounds. The phonological processor would then influence the meaning and context processors, thus enabling fluent reading and comprehension.

Scope of the Study

This study was conducted within a limited scope. The delimitations and limitations of this research are described below.

Delimitations

The study was delimited by geographical location to Gainesville, Florida, a city located in the north central part of the state. The subjects were 40 middle-school students in three schools in Alachua County. Subject selection did not include consideration for gender or ethnicity.

Limitations

Previous informal reading experiences and formal reading instruction of the students may limit this investigation. Many of the students in the sample already experienced phonics instruction in the elementary school level. This previous knowledge may have contributed to their familiarity with phonics rules, thus enabling the word recognition process. Some of the students in the sample were provided reading instruction at the time of the study. This may have confounded the results.

Subject selection could be a limitation of the study. Only schools that provided permission for the study were included in the study, and only those students who turned in their parental permission forms were included in the sample. Thus random sampling procedures could not be used. Further, the results of this study may not be generalizable

to younger students or to students with strong phonological skills without systematic replication with these populations.

Definition of Terms

An understanding of the constructs, variables, and procedures discussed in this study requires an understanding of the terminology. The terms defined in this section are critical to the interpretation of this study.

Blending is the process of combining verbal units such as words, syllables, onsets and rimes, and phonemes in order to pronounce a word.

Continuous sounds are sounds that can be spoken or held for a length of time, for example, /s/, /f/, /m/, and /z/.

Onset and rime are units within a word. The onset is the spoken sound that corresponds to any consonants at the beginning of each written syllable, and the rime corresponds to the sound at the rest of the syllable (Goswami & Bryant, 1990). For example, in the spoken word "sake," the onset is /s/ and the rime is "ake."

Phoneme is the smallest unit of sound (Goswami, 1995). Phonemes usually correspond to single alphabetic letters, as in the examples of /s/ and /p/ in "sip." However, they also can correspond to pairs of letters, for example, /ch/ in "chair.'

Phonological awareness is one's sensitivity to, or explicit awareness of, the phonological structure of the words in one's language (Torgesen, Wagner, & Rashotte, 1994).

Segmenting is the act of breaking down of units such as words, syllables, onset and rimes, and phonemes.

Stop sounds are sounds that cannot be spoken or held for a long period of time. They are usually brief, staccato-like sounds, for example, /b/, /d/, /t/, and /p/.

Overview

The focus of this study is the investigation of the effects of phonological awareness training for middle school students with reading problems. Chapter II provides a review of relevant literature in the areas of phonological awareness, its role in the reading process, deficits in phonological awareness, and intervention involving phonological awareness. A theoretical model on which the intervention is based and implications of research are also discussed in this chapter. Chapter III provides a description of the methods and procedures used in this study. The results of the study are discussed in Chapter IV. Finally Chapter V presents a discussion of the results, implications for teachers and teacher educators, and recommendations for future research.

CHAPTER II
REVIEW OF RELATED LITERATURE

Introduction

Chapter II includes a summary of the literature on the role of phonological awareness in reading, implications of phonological deficits, benefits of phonological awareness instruction, and phonological awareness instruction for older students with reading problems. The chapter is divided into several sections. The first section involves a description of phonological awareness and its role in reading. A theoretical model that integrates phonological awareness into the reading process is also described in this section. The second section provides a description of the nature of phonological awareness deficits, how they manifest, and their influence on the reading process. The third section involves a detailed description of some of the landmark intervention studies that focus on phonological awareness skills. The fourth section focuses on older children who have reading problems and some of the intervention studies that have included older children. The chapter concludes with implications of previous research for this study.

Phonological Awareness and Reading Ability

Reading and writing in English depend on abilities that are language related and go beyond the abilities required for speaking and listening. Research has indicated that because English is an alphabetic language, success in learning to read is related to the degree to which children are aware of the underlying structure of words (Liberman &

Shankweiler, 1985). Over the last two decades reading research has seen a growing consensus about the importance of phonological processing abilities in the acquisition of early reading skills (Shankweiler & Liberman, 1989; Stanovich, 1988; Wagner & Torgesen, 1987). Phonological processing refers to mental operations that make use of the phonological or sound structure of oral language when individuals are learning how to decode written language (Torgesen, Wagner, & Rashotte, 1994). According to previous research, there are three kinds of phonological processing skills related to reading ability: phonological memory, rate of access for phonological information, and phonological awareness (Adams, 1990; Brady & Shankweiler, 1991; Crowder & Wagner, 1991; Torgesen, 1993).

Phonological memory is typically assessed by tasks that require brief, verbatim retention of non-meaningful sequences of verbal items (Torgesen, Wagner, & Rashotte, 1994). Performance difficulties on this type of task involve problems in mentally representing the phonological features of language (Torgesen, Kistner, & Morgan, 1987). According to Torgesen and his colleagues, evidence suggests that the representations, or codes, used to store verbal material on memory span tasks requiring immediate, verbatim, and ordered recall are composed primarily of the phonological features of the stimuli. Difficulties with the mental representation of phonological information make it difficult to engage in any task that requires the simultaneous storage and processing of individual sounds in words.

Rate of access for phonological information has been assessed in the literature by rapid automatic naming tasks. Denckla and Rudel (1976) introduced this type of task as a way of predicting and understanding individual differences in reading ability. The tasks

require individuals to name as rapidly as possible a series of 30 to 50 items printed on a page. Individual differences in the speed with which kindergarten children can name these types of items are strongly predictive of later differences in the rate at which they acquire word-reading skills in first grade and beyond (Bowers, Steffy, & Tate, 1988; Felton & Wood, 1989).

Of all the phonological processing abilities, phonological awareness seems to have been most frequently studied. Phonological awareness is generally defined as one's sensitivity to, or explicit awareness of, the phonological structure of the words in one's language (Torgesen, Wagner, & Rashotte, 1994). Experimental evidence indicates that phonological awareness is a critical prerequisite for learning to read (Juel, 1988; Juel, Griffith, & Gough, 1986; Tunmer, Herriman, & Nesdale, 1988). Phonological awareness helps children to map sounds onto symbols and to break words into their individual sounds--skills that are necessary to read an alphabetic language (Adams, 1990; Jenkins, & Bowen, 1994). The following sections provide a more in-depth discussion of phonological awareness. The following topics will be addressed: dimensions of phonological awareness, levels of phonological awareness, reciprocal relationship between phonological awareness and reading, and the role of phonological awareness in reading.

Dimensions of Phonological Awareness

The research on phonological awareness has given considerable attention to whether phonological awareness is a general ability or a collection of independent but related abilities (e.g., Lenchner et al., 1990; O'Connor et al., 1993). A few studies in the literature provide support for a "general ability" theory stemming from the high degree of

interrelatedness among dimensions of phonological awareness (e.g., O'Connor et al., 1993; Wagner & Torgesen, 1987; Yopp, 1988). This degree of interrelatedness means that the dimensions shared significant commonality and tapped a similar construct (Yopp, 1988).

Despite moderate support of phonological awareness as a general ability, a few issues remain unresolved. First, Lenchner et al. (1990) drew attention to the relatively few studies focusing on whether or not tasks measure an underlying single ability. Second, Wagner's (1988) meta-analysis indicated differential relations dependent on the measure of reading. Wagner found that two dimensions of awareness, blending and segmenting, did not have independent causal relations with word recognition (linking pronunciation with meaning) but did for word analysis (taking apart phonological units in words). Third, Lenchner et al. (1990) indicated that the way the dimensions relate to each other may represent more independence than we now propose; specifically they argued that varying strengths of relations among phonological awareness tasks may not support a general ability theory.

Researchers have identified and assessed many dimensions of phonological awareness. The following tasks have been used in recent research as indicators of phonological awareness: auditory discrimination, blending, counting, deletion, isolation, rhyme, segmentation, substitution, sound categorization, tapping, reversing order of sounds, and word-to-word matching (Ball & Blachman, 1991; Lundberg et al., 1988; O'Connor et al., 1993; Spector, 1995; Yopp, 1988). Among the dimensions identified, segmentation is the most frequently used. It has often been paired with other dimensions including blending (Cunningham, 1990; O'Connor et al., 1993), letter-sound

correspondence (Brady, Fowler, Stone, & Winbury, 1994), and invented spelling (Mann, 1993). In studies of older readers, segmenting has been used in combination with rapid naming and list learning skills (Cornwall, 1992) and with deletion (Lenchner et al., 1990).

The dimensions of phonological awareness can be regarded as falling along a continuum of difficulty. From easiest to hardest, the range of difficulty is as follows: rhyme, auditory discrimination, phoneme blending, word-to-word matching, sound isolation, phoneme counting, phoneme segmentation, and phoneme deletion (Yopp, 1988). Two factors often contribute to the difficulty of phonological awareness: the memory requirements of the task and the characteristics of phonological units.

Memory requirements of the task. Most phonological awareness tasks require material to be held in memory. For example, phonological awareness tasks are divided into two categories based on the memory processes and operations required: (a) one operation of verbal material followed by response, as in segmentation; and (b) one operation followed by holding the response to that operation in memory while performing other operations before making the final response, as in deletion (Yopp, 1988). For example, when asked what sounds are heard in "mat" (segmentation), the response requires one step of pulling apart sounds: /m/ /a/ /t/. However, when asked to delete the first sound from "mat," the response requires two steps: (a) identifying the beginning sound and segmenting the sounds and (b) holding the remaining sounds in memory and blending them.

Characteristics of phonological units. A number of characteristics of phonological units have been found to affect difficulty including: (a) position of the

phonological unit in the word (i.e., first, middle, or last), (b) degree of abstraction, (c) size of sound unit, and (d) phonological properties of the phoneme(s). Research points to the differential difficulty for initial, medial, and final positions, with initial and final positions easier than middle (Byrne & Fielding-Barnsley, 1989; Mann & Brady, 1988; Spector, 1995). Likewise, degree of abstraction, or degree of meaning, affects difficulty. In Lundberg et al.s (1988) intervention study the sequence began with segmentation of words from idea units in sentences, because words have meaning and are usually recognized naturally (i.e., without instruction). The teaching sequence ended with the least natural and most abstract phonological unit, segmenting phonemes in a word.

With respect to size of sound unit, phonemes are considered to be the smallest phonological unit. Research indicates that phonemes bear a critical relation to beginning reading (Wagner, 1988) and the processes at the phoneme level do not develop naturally or easily without instruction (Liberman & Shankweiler, 1985). In short, phonemes are difficult to perceive because (a) they are the smallest phonological unit, (b) they are not acoustically pure, and (c) they are independent of meaning.

Several intervention studies have focused attention on the relative difficulty of phonological properties. For example, McBride-Chang (1995) proved that stop sounds (e.g., /t/ and /d/) were more difficult to identify than continuous consonants (e.g., /f/ and /s/) for third and fourth graders. Other researchers have investigated the combined effects of phonological properties of tasks. For example, Spector (1995) conjectured that differential difficulty between phonemes and syllables (i.e., size) can in part be explained by their differential acoustical properties. Spector (1995) explained that we do not hear discrete pure phonemes, because they overlap; rather we hear syllables. Therefore, tasks

that require identifying, moving, and combining phonemes may be more complex than those that require manipulation of syllables.

Levels of Phonological Awareness

Recent research on the nature of phonological development has led to a growing understanding of how children set about learning connections between letters and sounds. In the development of phonological awareness, researchers have shown that there is a progression in the units of sounds that young children can identify within spoken words (Goswami, 1995). The levels of phonological awareness development are associated with the different phonological components of language, including words, syllables, onsets and rimes, and phonemes (Blachman, 1991).

Word. The awareness that the speech flow is a compilation of individual words is typically achieved at a very young age. The linguistic play of young children, including nonsense words and rhyming, provides evidence of this early level of phonological awareness (Bradley, 1988). When a child utters a single word that he has only heard in combination with other words, he is demonstrating the word level of phonological awareness.

Syllable. The simplest phonological unit within a word is the syllable (Goswami, 1995). Most children acquire the ability to segment words into syllables with minimal instruction (Lundberg, 1988; Liberman, Shankweiler, & Liberman, 1989). Activities such as clapping, tapping, and marching are often used to develop syllable awareness. This level of phonological awareness is useful for initial instruction in detection, segmentation, blending, and manipulation of phonological components of language.

Onset and rime. The terms onset and rime derive from linguistic theory, and denote units of sound (Treiman, 1988). The onset is the spoken sound that corresponds to any consonants at the beginning of each written syllable, and the rime corresponds to the sound of the rest of the syllable. For example, in the spoken word "night," the onset is /n/ and the rime is "ight." Goswami and Bryant (1990) argued that the most important phonological units for young children to manipulate consciously are onset and rime. Moreover, onsets and rimes are more consistent or predictable in their alphabetical representations than is a single phoneme and its letter representation.

Phoneme. The final level of phonological awareness that emerges with development is the phonemic level. Phonemes are the smallest units of sound that change the meaning of spoken words (Goswami, 1995). For example, "mat" and "hat" differ by a single phoneme at the beginning. Phonemes usually correspond to single alphabetic letters, as in the examples m and t in "mat." However, they can also correspond to digraphs (pairs of letters with a single sound), for example, /sh/ in "shop." Full phonemic awareness does not usually develop until children have been learning to read an alphabetic script for about a year (Morais, Cary, Alegria, & Bertelson, 1979). The relatively late emergence of phonemic awareness does not mean that children lack any knowledge of phonemes. Even pre-readers can hear individual phonemes at beginnings of words, where these initial phonemes often constitute single-phoneme onsets (Goswami, 1995).

Phonological Awareness and Reading: A Reciprocal Relationship

Previous research has hypothesized phonological awareness to be (a) a prerequisite for learning to read, (b) influenced by reading instruction and practice, and

(c) both a cause and a consequence of reading acquisition (i.e., reciprocal). The importance of establishing the relation between phonological awareness and reading acquisition is the differential implications of each relation for the timing and content of instruction. For example, if evidence suggests that phonological awareness is a prerequisite condition, then phonological awareness training prior to formal reading instruction is implied. However, if the evidence suggests that formal reading instruction develops phonological awareness, the timing and instructional sequence issues may be reversed. If evidence establishes that phonological awareness is necessary before reading instruction begins and that phonological awareness is developed by specific types of instruction, emphasis on phonological awareness before and during beginning reading instruction is firmly established. Under both conditions, phonological awareness would foster reading acquisition.

Phonological awareness as a prerequisite for learning to read. Over the past decade, growing support for a causal relation between phonological awareness and reading acquisition has been suggested (e.g., Liberman & Shankweiler, 1985; Stanovich, 1985). More recent reviews specifically concluded that evidence is sufficiently strong to establish that phonological awareness is a necessary condition for learning to read (Mann & Brady, 1988; Wagner, 1988; Wagner & Torgesen, 1987). The relationship between phonological awareness and reading was examined by scrutinizing three types of studies: (a) longitudinal, (b) experimental intervention, and (c) comparisons of good and poor readers.

Longitudinal studies were examined to obtain information about the relation between phonological awareness at an earlier age with reading achievement at a later age.

If consistent and strong correlation is found, phonological awareness could be said to predict later reading achievement. Four longitudinal studies were reviewed (Juel, 1988; MacDonald & Cornwall, 1995; Scarborough, 1998; Stuart & Masterson, 1992). The review revealed that phonological awareness reliably predicted reading achievement across the age levels of participants from preschool through high school.

Intervention studies provide a second source of support for the idea that phonological awareness is a prerequisite for learning to read (e.g., Ball & Blachman, 1991; Lundberg, Frost, & Peterson, 1988; O'Connor, Jenkins, Leicester, & Slocum, 1993; Vellutino & Scanlon, 1987). Wagner and Torgesen (1987) noted that if training in phonological awareness improves subsequent reading, it is reasonable to infer a causal relation. In intervention studies, the effect of phonological awareness instruction on subsequent phonological awareness development and reading was assessed with pre- and posttest comparisons of achievement. Phonological awareness instruction had a significant positive influence on subsequent reading measures in all intervention studies reviewed.

Finally, comparisons between good and poor readers revealed that good readers outperformed poor readers on decoding words, and that phonological awareness skills greatly facilitated decoding ability. Vellutino and Scanlon (1987) reported more than a decade's work of comparing poor second- and sixth-grade readers to good second- and sixth-grade readers. The researchers concluded that the ability to segment phonemes is a prerequisite for linking sounds to corresponding letters and subsequent word identification, and that poor readers were able to profit from phonemic segmentation training with positive effects on ability to identify words. These authors concluded that

phonemic segmentation is a necessary condition for decoding and not simply a consequence of reading. Other researchers who examined differences between good and poor readers reached the same conclusions (e.g., Adams, 1990; Lenchner et al., 1990; Stanovich, 1985).

Phonological awareness as a consequence of reading instruction. Smith, Simmons, and Kameenui (1997) conducted a review that produced limited evidence that phonological awareness is developed by reading instruction. The authors examined reviews of studies with skilled readers in nonalphabetic languages and reviews of studies with adult illiterates in alphabetic languages. Support for the consequence relation (i.e., phonological awareness is facilitated by reading instruction) was inferred from the higher levels of phonological awareness among individuals receiving more instruction and practice in reading skills (e.g., decoding) than those who did not receive instruction.

Reciprocal relation. The practical importance of the reciprocal relation between reading and phonological development has been established by many researchers (e.g., Adams, 1990; Stanovich, 1985; Vellutino & Scanlon, 1987; Wagner & Torgesen, 1987). Previous research has also provided recommendations for early identification of students at-risk for reading failure (e.g., low ability in phonological awareness) and early, explicit instruction in phonological awareness prior to and during beginning reading instruction (e.g., Ball & Blachman, 1991; Layton, Deeny, Tall, & Upton, 1990; Lundberg, Frost, & Peterson, 1988; Torgesen, Morgan, & Davis, 1992). Previous research seems to provide limited support for the idea that reading instruction facilitates phonological awareness. However there is strong evidence to suggest a reciprocal relation between phonological

awareness and reading. The existence of a reciprocal relation implies that phonological awareness is important prior to and during reading acquisition.

Theoretical Model of Phonological Awareness in the Reading Process

All beginning readers of an alphabetic script require word decoding skills to be able to comprehend written text. Kamhi and Catts (1989) discussed some of the requirements of the decoding process. Words heard or seen must be associated with previously stored concepts in an individual's mental lexicon that represents one's vocabulary. The lexicon includes information about a word's phonological or visual form, as well as information about the word's meaning and how the word relates to other words. In processing speech, word meaning is accessed via a word's phonological representation.

Output of the perceptual analysis is a representation of a word's acoustic and phonetic features used by the listener to activate a word's phonological representation in the lexicon. Print may be processed in two ways: (a) indirectly by way of the phonological representation or (b) directly by way of the visual representation. The phonological approach requires the reader to recode the visually perceived letters into their corresponding phonemes. Individual phonemes are then blended to form a phonological sequence that is matched to a similar sequence in the lexicon. Perfetti and Bell (1991) suggested that good readers are much more dependent on the indirect route than previously thought.

Decoding or word recognition is one part of reading; however, the ability to comprehend what is read is a higher-level skill (Swank, 1994). To facilitate comprehension, readers typically rely on previously stored knowledge about the language

and the world. Syntactic and morphologic knowledge are used by readers in comprehending written material.

Cassidy and Kelly (1991) examined the effects of phonological information for grammatical category assignments based on findings that English verbs contain fewer syllables than English nouns. Their investigation revealed that children and adults are sensitive to these differences. They found that adults use pseudowords more often in sentences as verbs if the number of syllables is small, whereas pseudowords are used as nouns more often if the number of syllables is large. In addition, they found that 4-year old children associate pseudowords with actions more often than objects if the pseudoword contains one rather than three syllables. The researchers found that the reader uses phonological information to process morphologic and syntactic components of sentences during reading comprehension. Thus, phonological codes are found to be the building blocks to not only decoding, but also comprehension.

The idea that phonological information is crucial to comprehension is corroborated by the "simple" view of reading (Gough & Tunmer, 1986; Hoover & Gough, 1990; Juel, Griffith, & Gough, 1986). This view of reading proposes that differences in reading comprehension are a function of the outcome of two factors, phonological coding abilities and listening comprehension. The assumption is that each factor is necessary, but not sufficient, for success in reading. Hence, understanding the language being read (i.e., listening comprehension) is only one component of reading comprehension. The ability to use phonological codes to recognize the words of the text is the other necessary component of reading comprehension.

Currently, a large body of research supports the simple view of reading (Hoover & Gough, 1990; Juel, Griffith, & Gough, 1986; Vellutino & Denckla, 1991). These researchers suggest that although reading is a complex process, it can be conceptualized as comprising two primary components: phonological coding abilities (more specifically, decoding, or word recognition) and listening comprehension. Decoding involves using phonological coding abilities and orthographic knowledge to recognize printed words. Conversely, the comprehension process relies on linguistic and world knowledge to grasp the meaning of the printed word.

In the early school grades, phonological coding abilities (e.g., decoding) or orthographic knowledge accounts for more variance in reading ability than do language and world knowledge (Swank, 1994). On the other hand, in the later elementary grades, individual differences in semantic and syntactic knowledge explain considerably more variance than phonological coding processes (Hoover & Gough, 1990; Juel, 1991). Thus, phonological coding abilities seem to be most critical in the beginning stages of learning to read. Listening comprehension may be more important during the later stages of reading, after children have begun to master basic word recognition skills and as reading materials become more advanced.

Understanding how reading develops provides a framework for planning for reading instruction and also for diagnosing reading disorders. One theoretical model that analyzes the reading process in depth is Adams's (1990) model of reading. Adams seems to agree with the proposition that decoding is necessary for reading comprehension to occur. Her model explains the process of reading by describing the functions of four

interconnected processors. These four processors are the orthographic processor, the phonological processor, the meaning processor, and the context processor.

The orthographic processor. The orthographic processor receives visual information from print. This information is typically recognized from previous associations and is transmitted to the meaning and context processor for interpretation. Previously learned associations make reading automatic and easy. The orthographic processor also helps in reading words that are unfamiliar by breaking long words into syllables that are recognized from previous associations. For example, in reading an unfamiliar word such as "anfractuosity" one would read the word syllable by syllable, rather than holistically or letter by letter. This ability to break unfamiliar words into simple letter sequences is automatic for skillful readers and is facilitated by the orthographic processor.

The context processor. The context processor provides a suitable context for interpretation of text. The primary function of the context processor is to select the most appropriate word meaning for the text. For example, the context processor would tell the reader the meaning of the word "train" in the following sentence: "She used to train students to play football." The context processor provides information to the reader that in this situation, "train" is not a vehicle; instead it is a verb. The context processor also serves to speed the reading process and facilitate comprehension. However, for the context processor to work, print has to be identified correctly by the orthographic processor.

The meaning processor. The meaning processor provides the meaning to the information that is obtained from print. In addition, it enables the reader to acquire

meanings of new words by encountering them in context. Thus, there is a direct link between the meaning and the context processor. Skilled readers seem to be sensitive to prefixes, roots, and suffixes. This may be due to a direct link between the orthographic and meaning processor. This link makes it easy for readers to see the similarities among the following words: "monosyllable," "monologue," and "monochrome." The connection between the meaning and orthographic processor facilitates vocabulary and spelling abilities.

The phonological processor. According to Adams' model, phonological processing abilities are crucial to skilled reading. Like the orthographic processor, the phonological processor also accepts information from the outside. However, the information it accepts is speech. Although the orthographic processor is responsible for familiar words, most skillful readers activate the phonological processor in addition to the orthographic processor. The phonological processor seems to provide the added accuracy and speed for fluent reading and comprehension. Adams proposed that the phonological processor is responsible for fluent word recognition and comprehension.

With respect to word recognition, the phonological processor provides a backup system for recognizing unfamiliar words. For skillful readers, even if a word is unfamiliar, the phonological processor would recognize patterns of syllables and spelling-sound associations within the word. Thus, the reader's knowledge of sound-symbol correspondence will lead to the pronunciation of the word. The phonological processor facilitates comprehension as well. Phonological translations of words remain in memory longer than visual translations. Thus, the capacity of the short-term memory is increased. Further, the meaning and context processors can be called into play only

after words are recognized. Thus a thorough knowledge of sounds, symbols, and spelling patterns are crucial for the decoding process and eventually for comprehension.

Adams' model implies that readers who lack phonological awareness are likely to experience difficulties with reading tasks in which orthographic information is not sufficient. Such readers may not be able to decode unfamiliar words, thus slowing down the decoding process and impairing comprehension. For readers whose phonological processors are impaired, the context and meaning processors may not be automatically called into play. These readers may experience problems with an alphabetic language that has a unique set of sound-symbol correspondences. These problems may eventually lead to difficulties in word recognition and comprehension. The following section presents a brief review of literature on the nature of phonological awareness deficits, how they influence the reading process, and how persistent they are.

Deficits in Phonological Awareness

Research in reading has established a strong correlation between phonological awareness and reading ability. Thus, it would seem evident that deficits in phonological awareness should be linked to reading problems. The simple view of reading and Adams' model imply that if a person has deficits in phonological processing, word identification would be affected, thus preventing reading comprehension from occurring. Because phonological deficits seem to be at the core of most reading problems, it is important to study the nature of phonological awareness deficits and how they manifest in students who have reading problems. This section presents a discussion on a theoretical model of phonological deficits, characteristics of readers with phonological deficits, and stability of phonological awareness deficits.

Theoretical Model of Phonological Awareness Deficits

In recent years, cognitive psychologists have studied extensively the nature of children's reading problems. Rather than looking for factors in the child's environment that may lead to reading problems, experimental psychologists have investigated differences in cognitive processes intrinsic to the child that may explain reading failure (Snowling, 1995). Experimental studies in psychology and medicine that focus on individuals with dyslexia have contributed to our understanding of phonological deficits and some of the underlying causes of reading failure.

Early explanations of dyslexia focused on the role of visual factors (Shaywitz, 1996). It was held that defects in the visual system were to blame for the reversals of letters and words that were observed among people with dyslexia. More recent research has shown that dyslexia involves a verbal deficit (Shaywitz, 1996). More specifically, dyslexic readers have phonological processing difficulties (Stanovich & Siegel, 1994). A theoretical model that explains reading problems in dyslexia is the phonological model or the phonological deficits hypothesis (Shaywitz, 1996; Snowling, 1995).

The phonological model is concerned with the development of the phonological system - the system responsible for manipulation of sounds used to communicate. During early speech development, children appear to be mapping the speech they hear on to utterances they produce, and there is evidence that the mappings they create become gradually refined as the child's phonological system develops (Nittrouer & Studdert-Kennedy, 1987). These refinements within the phonological system bring with them improvements in access to underlying phonological representations and increases in speech rate and verbal short-term memory (Snowling & Hulme, 1994).

To understand exactly how the phonological model works, one has to consider how language is processed in the brain. The language system is composed of a series of hierarchical modules (Shaywitz, 1996). At the upper levels of the hierarchy are components associated with semantics (vocabulary or word meaning), syntax (grammatical structure), and discourse (connected sentences). At the lowest level of the hierarchy is the phonological module, responsible for processing sounds. The phoneme, defined as the smallest segment of language, is the fundamental element of the linguistic system. Before words can be identified or understood, they must first be broken down into their phonetic units by the phonological module of the brain.

In spoken language, the breaking down process seems to happen automatically. However, reading must be learned at a conscious level and because alphabets are involved, the process is a little more difficult. The beginning reader must first come to a conscious awareness of the internal phonological structure of spoken words. Then he or she must realize that the orthography - the sequence of letters - represents this phonology.

In contrast, when a child has reading problems, a deficit within the language system at the level of the phonological module impairs his or her ability to segment the written word into its underlying phonological components. This explanation is sometimes referred to as the phonological deficit hypothesis (Shaywitz, 1996). According to this hypothesis, a deficit in phonological processing impairs decoding, preventing word identification. Thus, a lower-order linguistic function blocks access to higher order linguistic processes and to gaining meaning from text. Although the language processes involved in comprehension and meaning may be intact, they cannot be called into play, because they can be accessed only after a word has been identified.

The phonological model establishes a strong relationship between phonological processing deficits and reading problems. Consequently, more research has been devoted to deficits in phonological processing as the underlying cause of reading problems in a majority of children. These phonological processing deficits often seem to lead to other characteristics that impair the reading process. For purposes of diagnosis and intervention, it is important to study some of the characteristics that seem to be related to phonological processing deficits.

Characteristics of Readers with Phonological Deficits

It follows from the phonological model that the status of a child's underlying phonological system determines the ease with which he or she will learn to read (Hulme & Snowling, 1992). Several studies have concluded that there are many skills that are related to phonological representations. Consequently, children with phonological awareness deficits have been known to have deficits in these related areas: awareness of sounds in words, use of phonological codes in working memory, and retrieval of phonological codes from long-term memory.

Awareness of sounds in words. Research has shown that children who have reading problems often lack an awareness of sounds in words (Catts, 1993; Torgesen, Wagner, & Rashotte, 1994). They may fail to appreciate that words may rhyme or begin with the same sound. These children also tend to have difficulties identifying individual sounds in words and performing operations such as blending or segmenting phonemes.

Using phonological codes in working memory. Readers who have deficits in their phonological system have demonstrated difficulties in verbal short-term memory (Torgesen, 1985). These readers may have problems in following directions, taking

messages, or learning to pronounce new spoken words. Children with phonological coding deficits may perform poorly on tests of memory span, such as digit span. Others, however, may show no difficulties in digit span but have problems with memory for sentences. According to Webster and Plante (1992), phonological deficits affect the ability to use subvocal speech rehearsal to maintain phonologically coded information in working memory for phonological awareness tasks (such as segmentation or substitution).

Retrieval of phonological codes from long-term memory. There is evidence that some children with reading problems have trouble with long-term memory. Children at risk for reading problems often have word-finding problems (i.e., difficulty with remembering names of objects) (Catts, 1996). These children may demonstrate substitutions in their speech. Many will also frequently use words that lack specificity (e.g., the short thing) or they will show numerous pauses during speech. Some children with word-finding difficulties will demonstrate their deficits on tests of isolated word retrieval. Others, however, will have difficulties in speeded retrieval (Denckla & Rudel, 1976). Extending this work to object naming, Katz (1986) found that children with phonological deficits were less able than controls to label the objects of the Boston Naming Test, and had difficulties with low-frequency and polysyllabic words.

The characteristics of children who have phonological processing deficits make it difficult for them to learn the correspondence between the phonemes of speech and their representations in written language. These problems lead to difficulties in reading and spelling (Jenkins & Bowen, 1994). Initially some poor readers may have deficits that are limited to word recognition. However, as time progresses these children may begin to

perform below average on tests of higher-level language abilities as well. One reason for the below-average performance could be that poor readers may not read as much as good readers and, as a result, may not have the same amount of language experience as good readers. This may result in lowered performance by poor readers on tests of vocabulary and measures of listening comprehension. Some evidence is available to suggest that, over time, poor readers' verbal abilities may not keep pace with that of their normally developing peers due to the persistence of phonological deficits over time (Juel, 1988; Stuart & Masterson, 1992).

Persistence of Phonological Awareness Deficits.

Reading research has presented a controversy about whether differences in performance between children with reading problems and normally developing children should be construed as a deficit or a maturational lag (Satz, Fletcher, Clark, & Morris, 1981). According to the deficit model, there is something atypical in the underlying cognitive and/or neurological structure (Denckla, 1979). The maturational lag model, on the other hand, proposes that reading problems represent variants of normal development (Stanovich, 1986). According to this model, children with reading disabilities may eventually catch up with their normally learning peers.

To test the two models, researchers have conducted longitudinal studies analyzing children's reading performance and phonological processing abilities in elementary school through high school. If the performance of students with reading problems follows a maturational lag model, then these students will catch up with their peers as they grow older. On the other hand, if the deficit model is true, students with reading problems may have difficulties catching up with their peers and a large disparity between

students who have reading problems and those who do not may be apparent among students with reading problems and students without reading problems. The four longitudinal studies that were identified all established that academic deficits, especially reading problems, tend to persist for many years (Juel, 1988; MacDonald & Cornwall, 1995; Scarborough, 1998; Stuart & Masterson, 1992). The persistence of reading problems may suggest a deficit model rather than a maturational model, because a maturational model suggests that students with reading problems will catch up with their peers at a later age.

In Juel's (1988) study, the reading and writing development of 54 children was followed as they progressed from first through fourth grade. The children in Juel's sample attended a large elementary school and lived in a low socioeconomic area. The study began with 129 children in the first grade and ended with 54 in the fourth grade. The children were tested every year on phonological awareness, decoding, word recognition, spelling, comprehension, and writing. According to Juel, the probability that the child would remain a poor reader at the end of fourth grade, if a child had been a poor reader at the end of first grade, was .88. The children in Juel's study who became poor readers entered first grade with little phonemic awareness. In fourth grade, the majority of poor readers could not decode all the monosyllabic nonsense words. Juel also inquired about the children's reading experiences at home: what they read and how many books they read over a period of time. Juel reported that one of the factors that prevented students from improving their reading skills was a lack of reading experiences. The average good reader reported reading at home almost four nights per week, whereas the average poor reader reported reading at home about once a week.

MacDonald and Cornwall (1995) reported a similar follow-up of 24 teenagers who had participated in a study of phonological awareness when they were in kindergarten. Tests of word recognition, spelling, phonological awareness and comprehension were administered during kindergarten and 11 years later. MacDonald and Cornwall reported that scores on phonological awareness (as measured by the Auditory Analysis Test) in kindergarten were significantly correlated to phonological awareness scores 11 years later ($r = .47$). The researchers concluded that phonological awareness at the end of kindergarten is stable over an 11-year interval and is also a good long-term predictor of word identification and spelling skills for students at 17 years of age.

It was also found that although reading and spelling skills at kindergarten were not significantly correlated to reading and spelling skills 11 years later, phonological scores in kindergarten were significantly correlated with reading and spelling 11 years later. This finding implied that phonological awareness in kindergarten predicted word identification and spelling skills at age 17 better than did kindergarten achievement in word identification and spelling. In contrast, phonological awareness at age 6, albeit in its early developmental stages, was relatively more stable over this developmental time span, as well as being more accurate in predicting reading and spelling achievement.

Similar results were obtained by Stuart and Masterson (1992) and Scarborough (1988). Stuart and Masterson (1992) conducted a follow-up study of reading and spelling in a group of 10 year old children ($n = 20$) who were first assessed as 4-year old prereaders. When IQ was partialled out, there were significant partial correlations between phonological scores and reading ages and phonological scores and spelling ages.

These results indicate a predictive relationship between early phonological awareness scores and subsequent reading ability. Scarborough's (1988) study focused on assessing students in second grade and then again in eighth grade. Students were tested for reading, spelling, phonological awareness, verbal memory, rapid naming, and IQ. The correlations between grade 2 and grade 8 scores were .49 for phoneme deletion, .66 for verbal memory, and .51 for rapid serial naming. The findings suggest that phonological awareness skills tend to remain stable over time.

Overall, the longitudinal studies suggest that phonological awareness at kindergarten and preschool is predictive of phonological awareness skills and reading performance in middle and high school. This finding has practical significance, because it suggests that phonological awareness is a reliable assessment measure to identify at-risk students. Further, the findings suggest that phonological awareness at kindergarten reaches its peak of development sooner than do word identification and spelling skills. The fact that some children with phonological awareness deficits do not catch up with their peers even in middle school suggests that the development of phonological awareness conforms to a deficit model. The findings also imply that phonological awareness is an essential prerequisite for the acquisition of reading skills and corroborate the argument put forth by the phonological deficit model (that phonological awareness is required for decoding and comprehension).

If some children experience phonological awareness deficits and if these deficits are stable over time, then researchers and clinicians are faced with a challenge to learn more about the strategies that best facilitate growth in reading for children of all ages with deficits in phonological awareness. Because research has established that

phonological awareness is crucial to decoding and word recognition, much attention has been devoted to the training of phonological awareness in children with (and without) deficits in phonological awareness. Further, researchers have established the most important components of phonological awareness instruction and a preferred sequence of instruction. Almost all the intervention studies reviewed revealed that phonological awareness can be taught to those children who have deficits, and instruction in phonological awareness improves word decoding and phonological awareness skills, such as blending, segmenting, and deletion of phonemes.

Instruction in Phonological Awareness

This section presents a review of previous studies that focused on instruction in phonological awareness skills and word decoding. The ERIC database located all intervention studies that were published in refereed journals. The descriptors used in the search were "phonological awareness training," "phonological awareness intervention," and "reading instruction." Fourteen experimental studies were examined. Of them, 12 involved elementary school students, and 2 involved older readers. Normally achieving children and children with identified language and phonological awareness deficits were studied.

The length of interventions varied from a few days to about 9 months. Length of sessions varied from 10 to 30 minutes and ranged in frequency from daily to twice a week. Researchers have explored a variety of intervention models (i.e., small group or one-to-one instruction), varying the duration of the intervention and the choice of activities. Although many studies included intervention in phonological awareness skills, most of the studies included components that went beyond phonological awareness.

These studies focused on phonics instruction, involving letter-sound correspondences and decoding words. For example, in the Williams' (1980) study, after the students were taught blending and segmenting phonemes, they were taught to combine their auditory skills and letter-phoneme correspondence to decode and spell words made up of complex patters, such as CCVC, CVCC, and CCVCC. These studies and their results will be examined in further detail.

Components of Effective Instruction

In all the studies reviewed, researchers seemed to pay careful attention to the following components of instruction:

1. Phonemes were taught with the help of visual or concrete representations.
2. Phonological awareness skills were modeled by the teacher.
3. Instruction was explicit.
4. Practice with letter-sound correspondences was added to instruction.

Among all the phonological skills, blending and segmenting received most attention.

Concrete representation. Use of concrete representation of sound was an instructional feature of all studies. Concrete representation involves using objects (e.g., blocks) to represent a sound. For example, after students heard the teacher model a sound, the students then said the phoneme while simultaneously moving a marker representing the phoneme (e.g., Ball & Blachman, 1991; O'Connor, Jenkins, Leicester, & Slocum, 1993).

Modeling by teachers. Isolated individual sounds (phonemes) were orally produced by the teacher in a demonstration and by students in response and practice. Modeling helped students to learn the correct ways to produce sounds and manipulate

sounds in words (e.g., Ball & Blachman, 1988; Lundberg, Frost, & Peterson, 1988; O'Connor, Slocum, & Jenkins, 1995).

Explicit instruction. The following features common across the studies suggested that instruction was explicit: (a) teacher modeling specific sounds, (b) direct teaching of phonological awareness skills, (c) strategies (e.g., concrete representation), (d) rehearsal of skills, (e) scaffolding (i.e., providing graduated amounts of teacher, task, or materials assistance). Explicit instruction seemed to be effective for acquiring phonological awareness skills (e.g., Slocum, O'Connor, & Jenkins, 1993; Torgesen, Morgan, & Davis, 1992; Williams, 1980).

Letter-sound correspondence. In addition to teaching students the concepts of blending and segmenting, many studies included a component of letter-sound correspondence. The purpose of letter-sound correspondence was to help students understand how sounds relate to written symbols. Interventions that included letter-sound instruction with phonological awareness instruction reported significant differences in reading and phonological awareness measures (e.g., Ball & Blachman, 1988; Brady, Fowler, Stone, & Winbury, 1994; Williams, 1980).

Blending and segmenting. Reading an alphabetic language like English involves primarily blending and segmenting phonemes. Thus, a majority of studies concentrated on the acquisition of blending and segmenting skills. Some researchers focused on blending and segmenting at the onset-rime level (e.g., O'Connor, Jenkins, Leicester, & Slocum, 1993; Slocum, O'Connor, & Jenkins, 1993), while others focused on blending and segmenting at the phoneme level (e.g., Hurford et al., 1994; Torgesen, Morgan, & Davis, 1992).

All the intervention studies were similar in that they had all the components of instruction as discussed above. However, these studies differed in terms of the types of skills taught to children, frequency and duration of instruction, and age of children. These differences will be described and attention will be given to the differences in instructional techniques.

Variations in Instructional Techniques

Among the many researchers who investigated the effectiveness of explicitly training phonological awareness skills, several investigators developed experimental programs that can be adapted for use in the classroom with kindergarten and low-readiness first grade children (Ball & Blachman, 1988, 1991; Bradley & Bryant, 1983, 1985; Lundberg et al., 1988). Others have focused their intervention efforts on older students with learning disabilities (Williams, 1980). The literature presented different activities to promote phonological awareness skills and word decoding. The activities described in the following studies can be used and/or modified by classroom teachers and language, reading, and learning specialists. Table 1 provides an analysis of the training studies.

Table 1

Summary of Phonological Awareness Training Research

Intervention Built Around Sound Categorization			
Study	Sample	Intervention	Post-tests
Bradley & Bryant (1985)	65 Kindergarten and first grade children who had low scores on a sound categorization test	Sound categorization with visual representation using plastic letters	Schonell Test of Reading; Schonell Test of Spelling; Neale Analysis of Reading

Table 1--continued.

Results: 1. Children who were trained in sound categorization significantly outperformed the untrained children in the Schonell tests of reading and spelling.

2. Group 2 was significantly better than both controls in Schonell reading and spelling and in Neale reading.

3. No significant difference between groups 1 and 2 in the two reading tests, but group 2 surpassed group 1 in spelling.

Intervention at the Level of Onsets and Rimes

Study	Sample	Intervention	Post-tests
O'Connor, Jenkins, Leicester, & Slocum (1993)	47 preschool children with developmental delays	Instruction in onset-rime blending and onset-rime segmentation	Tests of rhyming, blending and segmenting

Results: 1. Trained groups showed significant gains on posttests. However, the groups showed no evidence of transfer across phonological tasks.

2. On blending, the blending group performed significantly better than the other groups.

3. On segmenting, the segmenting group performed significantly better than the other groups.

4. On rhyming, rhymers performed significantly better than the other groups.

Study	Sample	Intervention	Post-tests
O'Connor, Slocum, & Jenkins (1995)	66 kindergarten children with low phonological manipulation skills	Instruction was provided to three groups: blend-segment; global treatment; letter-sound control	Tests of blending, segmenting, syllable deletion, rhyme production; rapid letter naming; reading analog (reading a list of words).

Results: 1. Both treatment groups significantly outperformed the control on blending and segmenting. Blending and segmenting alone was as effective as more varied and broad phonological instruction.

2. The high skilled children named significantly more letters than did children who were low-skilled. The high skilled children also performed better than all of the low-skilled conditions on syllable deletion.

3. The high-skilled condition outperformed the children who were low-skilled on the reading analog task.

Study	Sample	Intervention	Post-tests
Slocum, O'Connor, & Jenkins (1993)	35 children enrolled in kindergarten	Instruction in onset-rime blending and onset-rime segmentation	Tests of blending and segmenting.

Results: 1. Children trained in both blending and segmenting showed significant gains in posttest. However, the children did not show evidence of transfer across phonological skills.

2. On tests of blending, only the segmenting-then-blending and word manipulation-then-blending groups made significant improvements from pretests to posttest.

3. On tests of segmenting, only the blending-then-segmenting and word manipulation-then-segmenting groups made significant gains from pretest to posttest.

Table 1--continued.

Intervention at the Level of Phonemes

Study	Sample	Intervention	Post-tests
Ball & Blachman (1988)	90 non-readers from Kindergarten	Instruction in phoneme segmentation and letter-sound correspondences	Word identification subtest of Woodcock Reading Mastery Test; tests of phoneme segmentation, letter names and sounds.

Results: 1. The phoneme segmentation group significantly out-performed the control groups on the segmentation test.

2. There were no significant differences among the three groups on letter name knowledge.

3. Both the treatment group and control group 1 had significantly higher letter sound scores than control group 2.

4. Over 34% of the treatment group were able to read 4 or more words on the WRMT, as opposed to 13% for the control group 1, and only 7% for control group 2.

Study	Sample	Intervention	Post-tests
Ball & Blachman (1991)	90 non-readers from Kindergarten	Instruction in phoneme segmentation and letter-sound correspondences	Word identification subtest of Woodcock Reading Mastery Test; tests of phoneme segmentation, letter names and sounds.

Results: 1. The phoneme segmentation group significantly out-performed the control groups on the segmentation test.

2. There were no significant differences among the three groups on letter name knowledge.

3. Phoneme awareness group and language activities group achieved significantly higher letter-sound scores than the control group, but did not differ from each other.

4. On the WRMT, scores of children in the phoneme awareness group were significantly higher than the scores of children in either language activities group or control group.

Study	Sample	Intervention	Post-tests
Hurford et al., (1994)	99 first graders identified as being at-risk for reading problems	Instruction in phoneme blending and phoneme segmenting	Woodcock Reading Mastery Test; phoneme discrimination; phoneme segmentation.

Results: 1. Both training groups significantly outperformed their respective control groups after training.

2. Both training groups significantly outperformed control groups on phoneme discrimination and segmentation

3. On tests of discrimination and segmentation, there were no significant differences between the not-at-risk children and the trained children after training.

4. The trained children's scores on WRMT were significantly higher than the untrained children.

Table 1--continued.

Study	Sample	Intervention	Post-tests
Marsh & Mineo (1977)	64 preschool children who were non-readers	Recognition of phonemes: with or without visual cue; stop v. continuants; initial position v. final position	Test of phoneme recognition

Results: Children who had visual cues significantly outperformed those without visual cues; performance was significantly better in the initial position with continuants; performance in the final position was superior for stops.

Study	Sample	Intervention	Post-tests
Torgesen, Morgan, & Davis (1992)	51 children enrolled in kindergarten. Those who scored between 15th and 50th percentile on a test of phonological awareness were selected	Instruction was provided to three groups: Blending & segmenting; only blending; and language experience activities (control)	Tests of phoneme blending and phoneme segmentation; reading analog (reading a list of words)

Results: 1. The group that was trained in both blending and segmenting significantly outperformed the other groups on posttests.

2. Training in both blending and segmenting facilitated the reading of new words on the reading analog.

Study	Sample	Intervention	Post-tests
Vellutino & Scanlon (1987)	Second and sixth graders, including children with and without reading problems. (N = 75)	Instruction in phoneme segmentation	Phoneme segmentation; word identification.

Results: Children trained in phoneme segmentation had significant gains in phoneme segmentation and word identification. They significantly outperformed those children who did not receive training.

Intervention Built Around Metalinguistic Games

Study	Sample	Intervention	Post-tests
Lundberg, Frost, & Peterson (1988)	390 children enrolled in Kindergarten	Instruction in metalinguistic games, including rhyming and segmentation of words and phonemes	Letter knowledge; test of language comprehension; vocabulary; metaphonological tests (including rhyming, blending, and segmenting at the word, syllable, and phoneme level)

Table 1--continued.

Results: 1. There were no significant differences between the groups on letter knowledge.
2. There were no significant differences between the groups on language comprehension.
3. On the vocabulary test, the experimental group outperformed the control group.
4. On metaphonological tests, the experimental group outperformed the control group.
5. Follow-up measures revealed that training influenced reading and spelling even in second grade.

Intervention Built Around a Broad Array of Phonological Skills

Study	Sample	Intervention	Post-tests
Brady, Fowler, Stone, & Winbury (1994)	61 children from Kindergarten	Instruction in rhyming, segmentation, categorization, and sound-identification	Letter knowledge; word identification; spelling; rhyme production; phoneme segmentation; phoneme deletion

Results: 1. There were no significant differences between training group and control on letter knowledge, reading, and spelling.
2. The training group outperformed the control on measures of rhyme and segmentation.
3. There were no significant differences between training group and control on phoneme deletion.

Study	Sample	Intervention	Post-tests
Gillam & Kleeck (1995)	16 preschool children with developmental speech and language disorders	Instruction in rhyming, identifying initial sound, sound matching, blending, and segmenting.	Tests of rhyming and phoneme awareness (includes sound matching, blending, and segmentation)

Results: Intervention resulted in significant improvements on measures on rhyming and phoneme awareness in children who received training.

Intervention Using Specific Programs

Study	Sample	Intervention	Post-tests
McGuinness, McGuinness, & Donohue (1995)	45 children enrolled in a preschool	Instruction in Auditory Discrimination in Depth	Word identification and word attack subtests of Woodcock Reading Mastery Test

Results: 1. The trained groups significantly outperformed the control group on word identification and word attack, but did not differ from each other.

Study	Sample	Intervention	Post-tests
Williams (1980)	102 children with learning disabilities. Children were enrolled in Title I schools and ages ranged from 7 to 12	Experimental group was trained in ABDs of Reading (blending, segmenting, and decoding)	Syllable blending; syllable segmentation; phoneme blending; saying initial phoneme; phoneme segmentation; decoding; letter-sound correspondences

Table 1--continued.

Results: 1. For the experimental group there was significant gain from pretest to posttest on all subtests
2. For the control group, there was significant gain from pretest to posttest on all but one subtest (final-phoneme analaysis).
3. Posttest scores of the instructed group were significantly higher than those of the control group on letter-sound correspondence, phoneme blending, and decoding. The instructed group's scores on phoneme segmentation were not significantly higher than the scores of the control group.
4. Six months after the completion of the program, the scores of the instructed group were still higher than those of the control group
5. It was also found that experimental group was able to read unfamiliar items (not encountered in the training)

Intervention built around sound categorization activities. Bradley and Bryant (1985) conducted one of the first large-scale training studies and demonstrated a causal relationship between phoneme awareness and reading and spelling. Sixty-five kindergarten and first-grade children who had low scores on a sound categorization pretest were selected and divided into four groups matched on IQ, age, gender, and sound categorization ability. The children in both groups learned to categorize words on the basis of common sounds. In the second group, children also learned to represent the common sounds with plastic letters. For example, they were able to see that when "hen" was changed to "pen" only one letter had to be changed. The plastic letters that represented the sounds stayed in place on the table, while the child changed the "h" to a "p." The children in a third group were taught to categorize the identical pictures on the basis of semantic categories (e.g., "hen" and "dog" were grouped together, because both are animals). These three groups participated in 40 individual lessons over a 2 - year period. A fourth group received no intervention.

After the intervention, the children who were trained in sound categorization consistently outperformed the untrained children in reading and spelling. However, the children who were the most successful on measures of reading and spelling were the

children who learned both to categorize words by their common sounds and to represent the sounds with plastic letters. Four years after the original study ended, a follow-up study found that the children who learned to make the connections between letters and sounds as part of their training in sound categorization were still the most successful in reading and spelling (Bradley, 1988).

Intervention at the level of onsets and rimes. O'Connor, Jenkins, Leicester, and Slocum (1993) examined the feasibility of teaching phonological manipulation skills to preschool children with disabilities. Children were selected from 55 children with developmental delays enrolled in preschool. Forty-seven children, 4-6 years old, were randomly assigned to receive training on one of three categories of phonological tasks (rhyming, blending, and segmenting) or to a control group. In Phase 1 of the study, each treatment group received training in only one task format. Blenders were taught to blend two and three phonemes presented as continuous sounds. For example, for "sseeennn," children would say "seen." Segmenters began separating sounds by saying two- and three- phoneme words slowly, without stopping between the sounds. For example, for "seen," children would say "sseeennn." Rhymers were provided with examples and were encouraged to generate rhymes for words.

Phase 2 of the study (4 weeks) involved reviewing the previously taught task and extending training to other tasks within the treatment skill area. Blenders were taught to blend words beginning with stop sounds, to blend words with all sounds separated, and to blend onset-rime. Segmenters were taught to separate words into onset-rime (s - een), to say all the separate sounds in words, and to identify the first sound. Rhymers continued

to produce rhymes, with the additional tasks of identifying whether or not a pair of words rhymed and selecting from three words the one that did not rhyme.

Results of the study showed that blenders and segmenters outperformed rhymers and the control group on posttests that involved blending, segmenting, and rhyming. The investigators concluded that phonological awareness skills can be taught to young children with learning disabilities even before formal reading instruction. Although training in one phonological area did not seem to lead to improvement in other phonological skills, the researchers found that children who received segmenting training improved in blending. This facilitating effect could be explored by teaching segmentation to a higher criterion than that achieved in this research, and by replicating the experiment with larger treatment groups.

O'Connor and her colleagues conducted two other studies that focused on onset-rimes. In a transfer study (Slocum, O'Connor, & Jenkins, 1993), 35 preschool children were divided into four groups based on the training they received in two phases: (a) blending and segmenting, (b) word manipulation and segmenting, (c) segmenting and blending, and (d) word manipulation and blending. Blending was taught using the onset-rime format. For example, for "/k/ /at/", the children had to say cat. As the children blended the onset and rime, they pointed to the appropriate picture. Segmentation was taught using two rectangles, one to represent the onset and one to represent the rime. For example to segment cat, the student had to say "/k/.../at/." The purpose of word manipulation was to control for many of the nonphonological aspects of instruction in phonological skills. The word manipulation tasks were analogous to the phonological tasks and provided experience in manipulating sounds in the speech stream. Although

the investigators did not observe transfer to other phonological skills, they found that the blending and segmenting group significantly outperformed all other groups.

In a later study, O'Connor, Slocum, and Jenkins (1995), randomly assigned 66 children into three groups: (a) blending and segmenting, (b) global array of phonological tasks, and (c) only letter-sound correspondence. Blending and segmenting were taught using onset-rime format and pictures were used to facilitate blending and rectangles for segmenting. The global treatment involved teaching children a series of phonological tasks, including blending, segmenting, rhyming, and word-to-word matching. The letter-sound control group worked with letters and were asked to give the sound for each letter. Results showed that both treatment groups outperformed the control group (the group that was taught only letter-sound correspondences) on blending and segmenting. It was also found that blending and segmenting were as effective as the global treatment. Hence among all the phonological skills, the most crucial seem to be blending and segmenting.

Intervention at the level of phonemes. Investigators have focused intervention on recognition of phonemes (Marsh & Mineo, 1977), blending and segmenting at the phoneme level (Hurford et al., 1994; Torgesen, Morgan, & Davis, 1992), and segmenting with letter-sound training (Ball & Blachman, 1988, 1991; Vellutino & Scanlon, 1987).

In Marsh and Mineo's (1977) study, 34 preschool children were taught to recognize phonemes. The training session extended over a 4-day period. There were two between-subject factors: (a) presence or absence of a visual cue (uppercase grapheme) and (b) phoneme type (stops vs. continuous) and two within-subject factors: (a) position of phoneme in the word (initial or terminal) and (b) phonemic contrast of the positive and negative exemplars (minimal or maximal). In the maximal contrast condition the two

words had no phonemes in common (e.g., "like"-"bag"), while in the minimum contrast condition the words differed in only one phoneme (e.g., "pan"-"dan").

The students in the visual cue group learned to pair the phoneme used in the recognition task with its grapheme; the remaining students learned the same phonemes but with colored cards rather than the graphemes as stimuli. The recognition task was forced-choice matching-to-sample (A-B-X) paradigm. On each trial, the student was instructed by a taped voice to indicate which word begins (or ends) with the sound X. The first word came from the left speaker and the second, from the right. The child then responded by pointing to one of the speakers. In the visual cue condition, each word appeared on the screen next to the appropriate speaker prior to audio presentation of the words. Students in the stop condition identified which word of a pair contained either the phonemes /b/ and /d/ or the phonemes /p/ or /t/ in the initial or final position. The students in the continuant condition identified words containing either the phonemes /s/ and /m/ or /f/ and /n/.

Results indicated that preschool children were capable of recognizing phonemes. The visual cue condition group outperformed the non-visual group. It was also found that performance was better in the initial position with continuants and performance in the final position was superior for the stops. Findings implied that continuants should be introduced before stops.

With respect to blending and segmenting at the phoneme level, the studies established that training resulted in improved performance. Hurford et al. (1994) studied first graders at-risk for reading difficulties. Ninety-nine children were identified as being at risk for reading difficulties; 53 children were at-risk for reading disabilities (RD), and

46 children were at risk for becoming "garden-variety" poor readers (GV). Half of the RD and GV groups received the intervention. A third group consisted of children not at-risk.

The phonemic blending and segmentation training was accomplished using magnetic letters and magnetic boards. The phonemic blending training began with CV syllables and progressed to CVC syllables. The letters were placed on the magnetic board while the student had to put the sounds together. The phonemic segmentation training also began with CV syllables followed by CVC syllables. Like the blending training, the letters were placed on the magnetic board while the student segmented the sounds each time pointing to the appropriate letter.

The training procedure was effective in significantly improving blending and segmenting skills. The training groups performed considerably better than control groups. Results also indicated that although there were significant differences between the trained (at risk) children and the not-at-risk children before training, none existed after training. Hence, the intervention was effective in increasing the phonological processing skills and improving word identification and word attack scores of the trained children.

Torgesen and his colleagues also reported evidence that children in kindergarten are capable of learning to blend and segment at the phoneme level. Torgesen, Morgan, and Davis (1992) studied 48 kindergarten children. Those children who scored between the 15th and 50th percentiles on a phonological awareness test were included in the sample. The sample was divided into three groups: (a) the AB group received training that included both blending and segmenting, (b) the B group received training in only

blending activities, and (c) the C group was exposed to a variety of meaning-oriented language-experience activities.

Phonological training for children in the B group involved identifying the words represented by sequences of separately presented phonemes. Blending was introduced as a multiple-choice activity, in which children identified the word (from sets of two or three pictures) that had been pronounced in its segmented form by the trainer. Following this activity, the children were taught to pronounce the segmented word with no visual prompts. Training in both the AB and B groups was accomplished by using the same seven word sets. These word sets were formed so that they each involved a limited number of different phonemes. The last two sets were review sets composed of words from the first five lists. The control group (C) engaged in a variety of activities that emphasized reading and books as enjoyable and meaningful. Training for all groups lasted about 7 weeks. Training was done in groups of three to five children for 20-minute sessions three times a week.

Results indicated that the AB group significantly outperformed the C group on segmenting. For blending, it was found that the means of both the AB and B groups were significantly higher than the C group. The investigators found that training in both blending and segmenting skills produced significant improvements in children's ability to segment words into phonemes. In contrast, the blending-only group did not show significant improvements in segmenting, compared to the control group. It was also found that the children in the AB group were able to generalize the oral-language phonological awareness they had acquired in training to a novel task: learning to read new words.

In contrast to the above studies wherein children were taught both blending and segmenting, a few studies concentrated on segmentation in combination with letter-sound training. Vellutino and Scanlon (1987) used segmentation and letter-sound correspondence in their training. This study will be discussed in detail in the section on older children. The other studies that involved segmentation and letter-sound training were that of Ball and Blachman (1988, 1991). In the studies by Ball and Blachman (1988, 1991), 90 kindergarten children were randomly assigned to either a treatment group or one of two control groups. Children in the treatment group learned to segment one-, two- and three phoneme items and also learned letter-sound associations. Children in the control group engaged in a variety of language activities (e.g., listening to stories) and also learned letter-sound associations by using the same letter sound stimuli as the phoneme awareness training group.

The children in the phoneme awareness treatment group and the control group met in groups of five for 20 minutes, four times a week for 7 weeks. For the treatment group, each session contained three components: (a) say-it-and-move-it activities, (b) segmentation-related activities, and (c) letter-sound training. During say-it-and-move-it, children were taught to represent the sounds in one-, two-, and three phoneme words by using manipulatives such as disks, tiles, buttons, or blocks. Children were taught to say each sound in a word and move a block or disk to represent that sound. The segmentation-related activity included teaching children to categorize words on the basis of their common sounds. In addition, children learned to segment with the help of Elkonin boxes. The children were taught to say the word slowly as they moved a disk into a corresponding square to represent each sound in the word. For letter-sound

correspondences, children learned keywords and phrases to help them remember the sound of each letter (printed on a card). For example, the "f" card was illustrated with five funny faces.

Ball and Blachman (1988, 1991) found that the phoneme segmentation training group performed significantly better than the control group on tests of phoneme segmentation. The investigators concluded that it is possible to teach kindergarten children to segment phonemes. Those children who received training could generalize segmentation training to novel items not presented during training. Increased phoneme awareness also had an impact on the ability to read words. Another conclusion from this study was that increased letter-sound knowledge alone doesn't improve segmentation skills; children need intensive training in both segmentation and letter-sound correspondence.

Intervention built around metalinguistic games. The studies reviewed so far have demonstrated that teaching phoneme awareness and making the connections between letters and sound segments in the words have a positive influence on reading and spelling acquisition. Lundberg and his colleagues (1988) have reported a positive effect on reading by providing training in phonological awareness that did not include explicit instruction in sound-symbol associations. The researchers provided 8 months of metalinguistic instruction to nonreading kindergarten children. A wide variety of games, starting with rhyming activities followed by the segmentation of sentences into word units and the segmentation of multisyllabic words into syllables, were conducted for the first 2 months of training. Phonemes were introduced during the third month of training by helping children identify the initial phonemes in words, starting with words that begin

with continuous sound letters. Two months later, activities progressed to two-phoneme items and then to more complex words. Whole groups of children (15 to 20) participated in these activities.

The results of the study indicated that children who participated in this program had significantly greater phonological awareness than the control children, although there were no differences between the two groups on post-tests of prereading skills (letter knowledge and segmentation skills). By the end of first grade, however, the treatment children outperformed the control children in spelling, and by the end of second grade the treatment children outperformed the control children in reading and spelling. Thus Lundberg and his colleagues (1988) were able to increase phonological awareness outside the context of formal literacy instruction by using group games and whole-class instruction provided by regular classroom teachers. Once formal reading instruction began, it appears that this heightened awareness of the phonological structure of language gave children an edge that was evident in their superior scores in reading and spelling at the end of second grade.

Intervention built around a broad array of phonological skills. Instead of concentrating on one isolated phonological awareness skill, some researchers studied the effects of teaching children a broad array of phonological skills. Brady, Fowler, Stone, and Winbury (1994) studied the effects of phonological awareness training on at-risk kindergarten children. There were 24 children in the training group and 37 in the control group. Phase one of the training involved phonological awareness above the level of the phoneme. Children were trained in rhyming, segmentation, categorization, and identification. Rhyming games included listening to nursery rhymes, completing rhymes,

and generating rhyming words. Segmentation training involved breaking up sentences, phrases, and words into progressively smaller units. Categorization involved grouping pictures on the basis of similar initial sound or rhyme. Identification was taught by having children identify a particular syllable in a series of words. This phase of the training lasted about 4 weeks.

Phase two of the training lasted for about 6 weeks. In this phase, children were taught to isolate phonemes. Activities involved introducing one pair of phonemes at a time. The similarities and differences were highlighted by providing descriptive labels and by using mirrors so that children could receive feedback on mouth and tongue positions while making the sounds. Other activities such as sound categorization, phoneme deletion, and phoneme identification were also taught.

After children were comfortable with isolating phonemes, they were taught in a third phase to segment words into individual phonemes. Pictures of words were presented and empty squares (Elkonin boxes) under the picture represented the word segments. The children learned to put a tile into each square to represent each phoneme. This phase of training lasted for about 8 weeks. Results of the study showed that the training program yielded significant gains in rhyming, phoneme segmentation, and phoneme deletion. Findings were encouraging because there was evidence to show that at-risk nonreaders could master phonological awareness skills and training in these skills improved the children's spelling skills (on posttest).

A broad array of phonological skills was also the focus of a study carried out by Gillam and van Kleeck (1996). They trained 16 preschool children with developmental speech and language disorders on phonological awareness tasks for a period of 9 months.

The control group included a group of older children (mean age = 6) with speech and language impairments from the same school. In the fall semester, training included rhyming activities. Children attended a rhyming center for 15 minutes twice a week. Rhyming activities involved recognizing, imitating, identifying, and generating rhymes. During the spring semester, phoneme awareness activities were introduced. The sequence of activities followed was: teaching the initial sound, identifying when words are pronounced correctly, initial position sound matching, initial sound identification, generating words, phoneme blending, and phoneme segmentation.

Intervention resulted in significant improvement on measures of rhyming and phoneme awareness in the groups of preschool children with language impairments who received training. The treatment groups also significantly outperformed the control group. At the beginning of the study, children in the training groups performed poorly on the phoneme awareness tests. After training, the treatment groups were significantly better than the control group on the same tasks. Finally, the researchers found that phoneme awareness improvement correlated significantly with a measure of pre-literacy development.

Phonological awareness training using specific programs. Two studies in the review involved specific programs. Williams (1980) used the ABDs of Reading. This study will be discussed in the section on older children. The other study that used specific programs was that by McGuinness, McGuinness, and Donohue (1995). The researchers selected 45 first graders and assigned them to two experimental groups (one with 16 children and the other with 15 children) and a control group (with 14 children). The children had above-average verbal ability, and they also had some prior exposure to

letter-sound correspondences, phonics, and invented spelling. The training program used was Auditory Discrimination in Depth (ADD). The classroom teachers received a total of 32 hours of training in ADD.

The ADD consists of teaching children how sounds are formed by encouraging them to look closely at their mouth with help of mirrors. They are taught categorization of nasals, simple vowels, complex vowels, and multisyllable words. Multisyllable words are taught by using large colored felt pieces to represent syllables and blocks to stand for phonemes. Blending and segmenting were also taught using the blocks (to represent phonemes). The sessions were about 45 minutes in length everyday. The children in the control group engaged in their normal everyday activities. Posttests were administered to the children in both experimental groups and the control group.

ADD was effective in significantly increasing children's reading scores compared to their own initial performance. Both the experimental groups significantly outperformed the control group on word identification and on the Woodcock Reading Mastery series. The researchers also found that the ADD had a larger impact on decoding than on word recognition. The letter-sound correspondences and other phonological skills (blending, segmenting) facilitated the children's ability to read and spell. The investigators may have found positive results, because the children in the sample were already familiar with letter-sound associations and were already in a phonics program. This may have helped them to improve their reading and spelling skills.

From all the studies discussed thus far, it seems obvious that phonological awareness training benefits children who are at-risk for reading problems and those who have not had formal reading instruction. Previous experimental studies focusing on

phonological awareness training have generated some conclusions that have important implications for clinicians and practitioners. The next section discusses the conclusions that have come from these studies.

Conclusions from Phonological Awareness Training Studies

The findings of the studies on phonological awareness training indicate that a unidirectional causal model may not be appropriate for our understanding of the reading process. Evidence shows that early phonological processing skill predicts subsequent success in learning to read and that phonological processing is highly impacted by learning to read. Learning to read is facilitated if phoneme awareness is connected in a coherent way to graphemes for a child to be able to learn accurate and fluent decoding skills. The studies reviewed provide clinicians, practitioners, and researchers valuable information regarding phonological awareness and its relation to learning to read and how instruction in phonological awareness could be carried out. Some of the conclusions common to the studies are discussed below.

Children can learn phonological awareness skills even before formal reading instruction. Many studies showed that preschoolers who have not had formal reading instruction could learn phonological awareness skills such as blending and segmenting phonemes (e.g., Ball & Blachman, 1988, 1991; Brady, Fowler, Stone, & Winbury, 1994; Lundberg, Frost, & Peterson, 1988; Marsh & Mineo, 1977). If formal reading instruction is not required to learn phonological awareness skills, clinicians and practitioners could build these skills in children early in their literacy development. These phonological skills would enhance children's reading and spelling abilities and also improve the

reading performance of those children who may be at-risk for reading problems due to phonological deficits.

Children with phonological awareness deficits can be taught phonological awareness skills. Children who have phonological awareness deficits tend to have problems reading an alphabetic language. Because many of these children are not able to break words into individual sound units and match sounds to their symbols, they find decoding words and spelling difficult. However, research has shown that children with phonological awareness deficits and those who are at-risk can be taught phonological awareness skills required to read an alphabetic language (e.g., Brady, Fowler, Stone, & Winbury, 1994; Hurford et al., 1994; O'Connor, Slocum, & Jenkins, 1995; O'Connor, Jenkins, Leicester, & Slocum, 1993). These skills include identifying initial sound in a word, blending and segmenting at the onset - rime level, and blending and segmenting at the phoneme level. This conclusion seems most important for practitioners, because it provides hope that children with phonological awareness deficits can still learn those skills that are required to read an alphabetic language.

Phonological awareness skills, when taught, are enduring. Despite a dearth of longitudinal studies that addressed long-term effects of trained phonological awareness skills, training studies that involved a follow-up component showed evidence that trained phonological awareness skills tend to be maintained over an extended period of time (6 to 8 months) (e.g., Lundberg, Frost, & Peterson, 1988; McGuinness, McGuinness, & Donohue, 1995). More follow-up studies that involve assessing children a year or more after training may provide more information about the lasting effects of phonological awareness training. However, the fact that these skills may be sustained implies that

phonological awareness training for those children with deficits is worthwhile and should be considered in remedial reading programs.

Phonological awareness training can facilitate word identification skills. Experimental research on children with and without phonological deficits has provided evidence that phonological awareness skills facilitate word identification and spelling abilities (e.g., Ball & Blachman, 1988, 1991; Hurford et al., 1994; Lundberg, Frost, & Peterson, 1988; McGuinness, McGuinness, & Donohue, 1995; O'Connor, Slocum, & Jenkins, 1995). This finding implies that phonological awareness is a crucial prerequisite for reading. Hence, it makes sense to teach phonological awareness skills at an early age. Further, evidence shows that if children with phonological deficits are provided training in phonological awareness skills, their reading scores improve (e.g., Hurford et al., 1994). Thus the core problem in reading deficits may be phonological deficits, in which case it may be important to target these skills in children who are at-risk for reading problems.

Phonological awareness facilitates generalization. In addition to facilitating reading and spelling performance, phonological awareness training has also been shown to facilitate generalization, (i.e., children are able to read new combinations of phonemes, even those that they have not encountered in the training situation) (e.g., Ball & Blachman, 1988; Torgesen, Morgan, & Davis, 1992). Phonological awareness training involving sound-symbol associations may help children make correspondences between orthographic patterns and their pronunciations. This ability would help children read new words while they simultaneously make associations with words they encountered previously. If children are able to read new combinations of phonemes after training, it

implies that to facilitate children's word decoding skills, phonological awareness skills should be an integral part of every emergent literacy program.

Phonological awareness training is facilitated by letter-sound correspondences. Many studies have shown that children benefit from training if a component of letter-sound associations is included, along with phoneme blending and segmentation (e.g., Ball & Blachman, 1988, 1991; Brady, Fowler, Stone, & Winbury, 1994; Gillam & van Kleeck, 1996; Vellutino & Scanlon, 1987). Training in letter-sound correspondences may help children to be aware of the fact that one symbol can have different sounds. This knowledge could increase children's fluency in word recognition. Further, because English is an alphabetic language, knowledge of symbols and their respective sounds is crucial in word decoding and spelling. However, training in letter-sound correspondence alone does not seem to be adequate; it should be accompanied by training in other phonological awareness skills, such as blending and segmenting (O'Connor, Slocum, & Jenkins, 1995).

Some level of phonological awareness is necessary for training to be effective. Although studies have established that phonological awareness can be taught (e.g., Ball & Blachman, 1988, 1991; Bradley & Bryant, 1983, 1985) and training in phonological awareness improves reading performance (Hurford et al., 1994; Lundberg, Frost, & Peterson, 1988; McGuinness, McGuinness, & Donohue, 1995), some studies suggest that children should already have some phonological awareness abilities for training to be effective (e.g., Layton, Deeny, Upton, & Tall, 1988; Williams, 1980). This finding suggests a reciprocal relationship between phonological awareness and reading ability (i.e., phonological awareness helps a reader benefit from instruction and facilitates

reading performance). Research, however, is not clear as to the exact level of phonological awareness required in order to benefit from instruction.

The research in phonological awareness has been tremendously informative about beginning reading. Not only has a predictive relationship between phonological awareness and reading success been demonstrated, but it has also been established that phonological awareness is an important prerequisite for learning to read. Training studies have shown that providing systematic instruction in phonological awareness to kindergarten and first grade children can have a positive impact on beginning reading and spelling acquisition, especially when the instruction includes helping children make the connections between the sound segments of the word and the letters representing those segments.

For those researchers and practitioners interested in improving reading instruction and reducing reading failure, the real challenge is to ensure that all children are able to benefit from reading instruction. Research-based findings on phonological awareness training have important classroom implications, especially for those children who have reading problems and those who are at-risk. However, one limitation of these findings is that they may not be generalizable to all children who have reading problems. Almost all landmark studies on phonological awareness training have focused on only one population (i.e., elementary school students). Thus, a large gap exists in the literature with respect to training studies that target older students (middle and high school students) with phonological deficits.

Older Students with Phonological Awareness Deficits

Research on beginning reading has established that phonological awareness is a prerequisite for learning to read (Adams, 1990; Ball & Blachman, 1988, 1991; Bradley & Bryant, 1985). This finding implies that deficits in phonological awareness lead to reading problems, and research has established that children who have phonological deficits do have problems learning to read (Shaywitz, 1996). Although research on phonological awareness training has shown that children who have deficits can learn many of the phonological awareness skills, some studies have proved that these deficits tend to be persistent over time (Juel, 1988; MacDonald & Cornwall, 1995; Stuart & Masterson, 1992). The stability of phonological awareness deficits implies that students in middle and high school who have deficits will also experience difficulties in word decoding and spelling skills. The purpose of this section is to present information as to why middle school students may be a viable target population for phonological awareness training. The following topics will be discussed: prevalence of reading problems among children in the middle school, the nature of instruction in middle school, and phonological awareness training for middle school students.

Prevalence of Reading Problems in Middle School

Carnine, Silbert, and Kameenui (1990) suggested that reading deficits are the principal cause of failure in school. Considering the general school population, 10% to 15% of students experience difficulty in reading (Harris & Sipay, 1990). In special education, a majority of all students with learning disabilities have reading problems (Williams, 1980). It has also been documented that adolescents with learning disabilities experience academic deficits (Mercer, 1997). In a study of 300 students with learning

disabilities, Deshler, Warner, Schumaker, and Alley (1983) reported a clear trend in achievement levels from 7th to 12th grade. In reading and written language, the average performance of these students began at the high third grade level of 7th graders and plateaued at the 5th grade level for upper grades. Reith and Polsgrove (1994) also have documented academic deficits of adolescents with learning disabilities. They noted that the deficits are across the areas of reading, spelling, and math.

These studies provide evidence that many middle school students have deficits in basic skill areas. Many adolescents with learning disabilities fail minimum competency tests even when the tests are modified for them (Reith & Polsgrove, 1994). These deficits in basic skills and the skills measured on minimum competency tests are supported in the literature (Adams, 1990; Algozzine, O'Shea, Stoddard, & Crews, 1988). Deficits in basic skill areas (such as reading and spelling) could prevent students from progressing academically and learning higher order skills. Consequently, these students may have deficits in more than one area, because they may not be able to apply their basic skills effectively.

To determine the prevalence of phonological deficits in middle school students, the author conducted a study in Alachua County, Florida. As part of this study, special education teachers were contacted from four public middle schools. The teachers were asked to identify students who demonstrated reading problems. In this manner, 64 students in special education classrooms were identified and were administered the Lindamood Auditory Conceptualization Test (LACT). The purpose of the LACT is to determine if students could identify individual sounds within words and perform phonological operations such as phoneme substitution and reversal. (A more detailed

description of the test is presented in chapter 3). Table 2 provides descriptive information about the sample, including scores on the LACT.

Table 2

Descriptive Information for Subjects by School

		School 1	School 2	School 3	School 4	Total
Gender	Male	4	5	2	27	38
	Female	7	3	2	14	26
Mean Age		12.40	13.90	13.00	13.60	
Grade	6	9		2	9	20
	7	2	6	1	10	19
	8		2	1	22	25
Race	Caucasian	5	4	2	12	23
	African-American	6	4	2	28	40
	Asian					
	Hispanic/Latino				1	1
	Other					
SES	Free lunch	9	5	1	26	41
	Reduced lunch	2	3	3	12	20
Mean IQ (WISC-R)		91.40	100.40	100.60	90.40	
Mean Scores on LACT		40.74	68.81	69.90	54.90	

All of the students scored below the average score for middle school students (i.e., 93). They had difficulties with phonological skills such as phoneme addition, phoneme deletion, phoneme substitution, and phoneme reversal. These difficulties may be contributing to the reading problems they demonstrate in the classroom. The findings of this study suggest that there are middle school students who have reading deficits and that these deficits may be exacerbated by deficits in phonological awareness skills.

Research has suggested that adolescents tend to have academic problems because of the many demands placed on them in the middle school level. These demands include working independently with minimal feedback, demonstrating a broad set of cognitive and metacognitive strategies, taking frequent tests, expressing information through writing, and maintaining appropriate social interactions (Schumaker & Deshler, 1984; Putnam, 1992). In addition to these demands, the academic problems of middle school students may be exacerbated by the nature of instruction in the middle school level.

Nature of Instruction in Middle School

Some researchers have been concerned about the reasons behind adolescents' persistent academic problems and basic skill deficits. One explanation is that the secondary school setting does not provide adequate instruction in basic skills, and the criterion for success shifts from skill acquisition to content acquisition (Mercer, 1997). Many middle school teachers may assume that students already have the prerequisite basic skills. Moreover, even if middle school students get additional instruction in basic skills, they may not be able to practice applying their skills in the classroom, because teachers may concentrate more on higher order strategies.

Two studies provided information about the nature of instruction in the middle school level (Garcia et al., 1995; MacIver, 1991). Garcia et al.'s (1995) study targeted a 7th grade public school in a Midwestern school district. The investigators conducted observations of the classrooms and interviewed nine classroom teachers, two special education teachers, and a Chapter I teacher. With respect to reading instruction, the teachers reported that students engaged in oral reading in round-robin fashion and instruction was mostly whole-group. According to the teachers, comprehension was an important skill to develop. However, they did not teach students comprehension strategies. Most of the teachers did not feel comfortable teaching basic skills in reading to middle school students. Students who had reading deficits were not provided with additional instruction nor were they taught how to read or learn from textbooks. None of the teachers assigned out of class reading, on the grounds that they would not be completed.

MacIver's (1991) study proposed to describe the nature of remedial instruction in the middle schools. Questionnaires were sent out to 1025 schools, of which 1,008 responded. Results of the survey showed that the most common remedial activities were extra work or homework (in 56% of the schools), pull-out programs in reading (50%), after- or before-school coaching classes (46%), and peer-tutoring (45%). Although the study did not address the exact type of reading method(s) used during remedial instruction, the investigator found that the majority of the schools did not have one-on-one tutoring for students.

Although few studies provide information about the curriculum in the middle school level and the nature of reading instruction, the existing studies seem to suggest

that middle school students who have reading deficits may not be getting adequate instruction in basic skills. According to Juel (1988), many secondary schools tend to provide instruction in higher order skills (e.g., comprehension). Instruction in higher order skills may not benefit students who have reading problems, because their problems may lie at a more basic level. Juel (1988) proposed that the most straightforward way to reduce reading deficits in adolescents is to concentrate on the rapid and early attainment of lower level and prerequisite skills.

Phonological Awareness Instruction for Middle School Students

According to some studies, some middle school students have problems in word decoding. Hence, it would make sense to determine if students in middle school can be taught phonological awareness skills and if so whether reading acquisition accelerates. Among all the studies that focused on phonological awareness training, only two studies targeted older students (Williams, 1980; Vellutino & Scanlon, 1987).

Williams (1980) conducted a 2-year study to determine the effectiveness of an instructional program called ABDs of Reading. During the first year, the investigator selected children who were identified as having learning disabilities. The ages of the children ranged from 7 to 12. The pretests included auditory segmentation and blending of both syllables and phonemes, letter-sound correspondences, and decoding. According to Williams (1980) those children who were likely to profit from the program were selected. No cut-off scores were reported in the study. A total of 63 children formed the training group. Pretests were also administered to another group of children in comparable school districts. A total of 64 children from this group formed the control. For purposes of comparison, the pretests were also administered to a group of normally

functioning second graders. (The scores of the second graders were substantially higher than those of the other groups).

Classroom teachers were trained to use the program. They were asked to use the program everyday for 20 minutes. In the program (ABDs of Reading), children first learned the concept of analysis (segmenting) at the syllable level and then at the phoneme level. Children learned to represent phonemes using wooden squares. The next section, blending, was also taught using squares. Only CVC (consonant-vowel-consonant) units were taught. After the instruction on analysis and blending, letters were introduced, and letter-sound correspondence was taught. Again using wooden squares, which had letters on them, children learned to decode and spell combinations of CVC units. Teachers provided a meaningful context for the words by using them in a sentence. Overall, 26 weeks of instruction were completed.

Posttests indicated that scores of the trained group were significantly higher than those of the comparison groups on letter-sound correspondences, saying the middle phoneme in a word, saying all three phonemes in a word, and decoding. Even 6 months after the completion of the program, the scores of the instructed group were still higher than those of the comparison group.

During the second year of the study, the investigator selected classrooms from six different school districts. All classrooms were randomly assigned to treatment or a control group. There were 24 experimental classrooms and 16 control classrooms. Pretests were administered to all the children. The same instructional procedures were followed during the second year. Results from the posttest data indicated that the performance of the experimental groups improved significantly from pretest to posttest

on every measure. Also, the experimental groups scored significantly higher than the control groups on every subtest of the posttest except one phoneme analysis subtest (saying initial phoneme). With respect to transfer, the experimental groups performed significantly better than did the control groups on unfamiliar items, indicating that transfer occurred and that the instructional program had succeeded in teaching strategies of decoding.

Vellutino and Scanlon (1987) conducted an experimental study involving second and sixth graders. Children in this study were divided into poor and normal reader groups on the basis of oral reading ability. Poor readers were at or below the 10^{th} percentile on the Gilmore Oral Reading Test, and normal readers were at or above the 50^{th} percentile. Second grade normal readers were matched with sixth grade poor readers for oral reading ability and were found to be equivalent on both decoding and phoneme segmentation ability.

The five treatment conditions were phonemic segmentation training (PST); response acquisition (RA); phonemic segmentation and response acquisition (PSTRA); and two control conditions. Children in the PST group received 5 or 6 consecutive days (half-hour per day) of training in phoneme analysis. The specific exercises closely paralleled those given on the phoneme segmentation tests (i.e., counting phonemes, vocalizing phonemes, and combining phonemes). The stimuli used for these exercises consisted of both real words and pseudowords, presented both auditorily and visually. Segmentation exercises were followed by a free recall task and a paired associates learning task. The free recall task involved memory for nonsense syllables and was designed to provide children with practice in segmenting auditorily presented syllables.

The paired associates task was designed to provide subjects practice in detecting grapheme-phoneme correspondences in novel alphabetic trigraphs which were paired with consonant-vowel-consonant nonsense syllables.

Children in the RA condition were taught two separate tasks. The first involved 20 trials of free recall of four nonsense syllables. These stimuli were presented auditorily and in random order on each trial. The second task involved 15 association learning trials on which the same nonsense syllables were paired with animal cartoon pictures. The free recall task assessed children's ability to store and retrieve phonetic strings devoid of meaning. The picture-syllable task served as a measure of children's ability to learn the names of objects and simulated the process whereby children learn to attach verbal labels they have heard to objects in their environment.

Children in the PSTRA condition were given both phonemic segmentation training and response acquisition training. All five groups were tested 2 days after training. Results showed that poor readers in a given grade performed below the normal readers in that grade on both tests of decoding and segmentation. The second grade normal readers performed as well as the sixth grade poor readers on both tests. With respect to free recall of nonsense syllables and picture-syllable association, poor readers in both grade levels were less proficient than their normal reading peers on both free recall and picture-syllable. Findings also showed that poor readers at both grade levels performed considerably below the normal readers on tests of word identification. Despite these findings, results showed that with each reader group at both grade levels, the experimental treatments had positive effects. Further the scores of the children in the

PST and PSTRA were significantly higher than the other groups, but there was no significant difference between the PST and PSTRA groups.

The investigators concluded that although older children can learn decoding and phoneme segmentation skills, their phoneme awareness skills may set upper limits on their ability to identify words. Although the poor reader groups exposed to treatment performed better than the control groups, they did not come up to the level of the normal readers. The reason for this may be due to the short duration of the training program. However, the findings seem to suggest that older children can learn phonological manipulations that would help them in word decoding.

Both intervention studies that have involved older students suggest that these students are capable of learning phonological awareness skills. Although older students may not reach the level of their normally developing peers with respect to phonological processing abilities, instruction in phonological awareness may lead to some improvements in reading and spelling abilities. The persistence of phonological deficits into adolescence may be due to that fact that these skills are not targeted in the middle school level. Because instruction in basic skills tend to be ignored, students' deficits may continue to grow. In order to prevent failure and to improve reading performance, it is crucial for teachers to incorporate some aspects of beginning reading into remedial programs.

Implications for Research

The literature reviewed in this chapter provides a theoretical and empirical basis for this study. Research on beginning reading has provided evidence that phonological awareness is an important aspect of learning to decode words. Adams' theoretical model

(Adams, 1990) proposes that for reading comprehension to occur, the reader must have adequate phonological awareness skills. According to Adams' model, the phonological processor is responsible for breaking words into their individual units and performing phonological manipulations. If the phonological processor does not function properly, higher order functions (such as comprehension) cannot be called into play. That phonological awareness deficits lead to reading problems has also been suggested by the phonological deficit hypothesis (Shaywitz, 1996). Deficits in phonological awareness leads to difficulties in word decoding and eventually comprehension. Information based on these theoretical models imply that the reading problems experienced by older children may result from phonological awareness deficits.

Because many remedial programs in the middle school level seem to ignore basic skills such as phonological awareness, deficits in phonological processing abilities tend to persist, leading to many years of reading failure. If research has shown that training in phonological awareness results in improvements in phonological awareness skills, word decoding, and spelling, it seems logical to target these skills even in older children who have deficits in decoding. By teaching older students phonological awareness skills crucial to the reading process, it is hoped that these skills would improve their word decoding abilities.

This study builds on the existing research by examining the effects of phonological awareness instruction on a population that has been previously neglected - middle school students. This approach is supported by Adams' model, the phonological deficit hypothesis, data on the prevalence of reading deficits in the middle school level,

and successful results from the body of phonological awareness training research targeting beginning readers and children with reading deficits.

CHAPTER III
RESEARCH METHODOLOGY

Introduction

In this chapter, the methods and procedures of the study are presented. The chapter begins with the hypothesis that was tested. The second section is a description of the subjects, sampling procedures, instructional procedures, and measures. The subsequent sections include descriptions of the design and treatment of the data.

Hypotheses and Research Question

The purpose of the study was to determine the effects of phonological awareness instruction for middle school students with learning disabilities who were identified as having reading problems. The primary research question of the study is: Does instruction in phonological awareness skills influence the acquisition of phonological awareness and word identification skills? To address this question, the following null hypotheses were tested at the .05 level of confidence:

H_1: Students who receive phonological awareness instruction will not outperform students who do not receive instruction on measures of phonological awareness, including elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, and segmenting nonwords.

H_2: Students who receive phonological awareness instruction will not outperform students who do not receive instruction on a measure of word identification.

Setting and Subjects

This section includes a description of the instructional settings and information about the subjects. The setting description includes information about each school. The subject description includes demographic information by school and by group. An explanation of sampling and assignment procedures is also provided.

Instructional settings. The study required a sample of students at the middle school level who have learning disabilities and have been identified as having reading problems. Three public middle schools in Alachua County were selected. These schools have a high percentage of students in ESE classrooms, and they provided permission to include their students in the study. The socioeconomic status of individual students was not considered as a factor in this study. However, this information is presented along with other demographic information in Table 3.

Subject description. Fifty middle school students were screened using the Lindamood Auditory Conceptualization Test described later in this chapter. Of these 50 students, 40 were selected as participants in this study. Teachers were asked to identify those students who had poor attendance records or who, for any other reason, may not be able to complete the entire instructional process. These children were eliminated from the pool of participants. Parental informed consent for participation were obtained for all participants as required by the University of Florida Institutional Review Board (See Appendix A). A summary of the demographic information from the 40 students is presented by school in Table 3. Table 3 also includes the group assignment of subjects from each school.

Table 3

Descriptive Information for Subjects by School

		School 1	School 2	School 3	Total
Gender	Male	6	8	6	20
	Female	7	7	6	20
Mean Age		13.50	13.70	12.45	
Grade	6			8	8
	7	5	11	4	20
	8	8	4		12
Race	Caucasian	4	4	3	11
	African-American	7	11	9	27
	Asian				
	Hispanic/ Latino	2			2
	Other				
SES	Free lunch	5	6	4	15
	Reduced lunch	8	9	8	25
Group assignment	A	7	8	5	20
	B	6	7	7	20

Table 4

Descriptive Information for Subjects by Group

	Group A	Group B
Gender: Male	12	8
Female	8	12
Mean age	12.90	12.90

Table 4--continued.

	Group A	Group B
Grade: 6	2	6
7	8	12
8	10	2
Race: Caucasian	9	2
African-American	10	17
Asian		
Hispanic/Latino	1	1
Other		
SES: Free Lunch	7	8
Fee-reduced Lunch	15	10

Test Mean Scores	Group A	Group B
Peabody Picture Vocabulary Test-R (IQ)	99	98
Lindamood Auditory Conceptualization Test	49.00	49.35
Woodcock Reading Mastery Test-R Word Identification	41.35	40.45
Comprehensive Test of Phonological Processing	67.35	63.75

Matching was used to assign the 40 students into two groups, A and B. The variable that was used for matching was the score on the Lindamood Auditory Conceptualization Test. Table 4 includes information on the two groups. The table also includes test data for the groups.

Instructional Procedures

The instructional procedures are described in this section. First, the duration and number of sessions for each group are outlined. The following sections include an account of various aspects of the instructional sessions.

Procedures for Instructional Sessions

Instruction in phonological awareness skills were provided on a one-to-one basis for students in both groups A and B. The duration of instruction for both groups was about 4 weeks. Students were instructed for 3 days per week, and they were taught 2 lessons per day. The total number of lessons for both groups was 18 (including a review). The instructional procedures for students in both groups were exactly the same, except that instruction for group B began after instruction for group A has been completed. During instruction, presentation of skills was conducted using the direct instruction procedures described by Carnine, Silbert, and Kameenui (1990). For each skill, the instructor modeled the correct response and provided feedback as the students practiced with the particular skill. When an error was noted in a student's response, the instructor modeled the correct response.

Instructional Program

The instructional program that was used for the study was the Great Leaps Reading program devised by Mercer and Campbell (1998). It was originally designed for children from kindergarten through second grade. For the purposes of this study, some changes were made to make lessons more age appropriate. For example, two lessons (repeating words and tapping number of words) were omitted. Following are some lessons that were added:

1. Blending two words to make a new word
2. Segmenting a word to make two words
3. Phoneme reversal
4. Phoneme substitution

Sequence of Instruction

The students worked with easy tasks first and then moved to more difficult ones. The sequence of instruction was as follows: rhyming; identifying words with same beginning or final sound; blending words, syllables, and phonemes; segmenting words, syllables, and phonemes; phoneme deletion; phoneme reversal; and phoneme substitution. This sequence was suggested by previous studies (Lundberg, Frost, & Peterson, 1988; Yopp, 1988). For blending and segmenting, the sequence that was followed was: words, syllables, and phonemes. This sequence was also suggested by previous research (Goswami, 1995). The lessons for each skill are presented in Table 5.

Table 5

Lessons for each phonological skill

Skill	Lesson(s)
Rhyming	Selecting the odd one out (the word that doesn't rhyme) Generating rhymes
Beginning or final sound	Selecting words with same beginning sound Selecting words with different beginning sound Selecting words with same final sound Selecting words with different final sound Saying beginning, middle, or final sound of a word

Table 5--continued.

Blending	Blending two words to make a new word Blending syllables Blending phonemes
Segmenting	Segmenting a word into two words Segmenting words into syllables Segmenting words into phonemes
Phoneme deletion	Saying a word with a part or a beginning sound missing Saying a word with a final or middle sound missing
Phoneme reversal	Saying a word with two sounds reversed
Phoneme substitution	Saying a word with one sound replaced by another sound
Review	All lessons

Nature of Lessons

Each lesson constituted only one type of task. The lesson began with specific explanations of what the student had to do. The instructor provided an example and modeled the right response. (Table 6 consists of the explanations that the instructor provided for each lesson and the type of response required by the student, and Appendix B has the lessons with all the items). To ensure understanding, two practice items were provided for each lesson. Then, the instructor scored the student's performance on 30 items for each lesson. Students practiced each lesson until they reached mastery. The mastery score was set at 25 for each lesson.

The mode of presentation for all the tasks was auditory, and students' responses for all tasks was verbal. If students offered an incorrect response or stated that they did

not know the right response, the instructor provided the correct response verbally. For every task, correct responses was documented on a chart for each student. When the student made an incorrect response on a particular item, the item was scored as an error, but the instructor immediately provided the right response. Number of correct responses was noted on a progress chart so that students could monitor their own progress on each lesson until mastery was reached.

Table 6

Description of individual lessons

Selecting the odd one out	
Purpose	To determine if students can pick the odd one out; i.e. select the word that does not rhyme.
Explanation provided by instructor	I am going to say three words. I want you to tell me the one word does not rhyme. For example, if I say, "cat, sat, milk," you would say "milk."
Response required by student	Saying the word that does not rhyme
Generating rhymes	
Purpose	To determine if students can produce rhyming words given a target word.
Explanation provided by instructor	I am going to say a word. I want you to tell me a word that rhymes with the word that I say. For example, if I say, "book," you would say "look" or "cook."
Response required by student	Saying a word that rhymes with the target word.
Selecting words with same beginning sound	
Purpose	To determine if students can compare beginning sounds of words and select two words (from a list of three) that have the same beginning sound.
Explanation provided by instructor	I am going to say three words. I want you to tell me which two words have the same beginning sound. For example, if I say "tent, race, tall," you would say "tent, tall."
Response required by student	Saying the two words that have the beginning sound.

Table 6--continued.

Selecting a word with different beginning sound	
Purpose	To determine if students can pick the odd one out; i.e., from a list of three words, selecting a word that has a different beginning sound.
Explanation provided by instructor	I am going to say three words. I want you to tell me which word has a different beginning sound. For example, if I say, "mine, beach, bat," you would say "mine."
Response required by student	Saying the word that has the different beginning sound.
Selecting words with the same final sound	
Purpose	To determine if students can pick out two words (from a list of three) that have the same final sounds.
Explanation provided by instructor	I am going to say three words. I want you to tell me which two words have the same final sound. For example, if I say, "boat, seed, hat," you would say "boat."
Response required by student	Saying the two words that have the same final sound
Selecting words with different final sound	
Purpose	To determine if students can pick out a word (from a list of three words) that has a different final sound
Explanation provided by instructor	I am going to say three words. I want you to tell me which word has a different final sound. For example, if I say, "bat, time, coat," you would say "time."
Response required by student	Saying the word that has a different sound.
Saying beginning, middle, or final sound of a word	
Purpose	To determine if students can identify the beginning, middle, or final sounds in a given word
Explanation provided by instructor	a. I am going to say a word. You need to tell me the beginning sound. For example, if I say, "mouse," you would say /m/ b. I am going to say a word. You need to tell me the middle sound. For example, if I say, "cot," you would say /o/ c. I am going to say a word. You need to tell me the final sound. For example, if I say, "leaf," you would say /f/
Response required by student	Saying the beginning, middle, or final sounds of a word according to specific instructions
Blending two words to make a new word	
Purpose	To determine if students can put two words together to make a new word
Explanation provided by instructor	I am going to say two words. I want you to put them together to make one word. For example if I say, "butter, fly," I want you to say "butterfly"

Table 6--continued.

Response required by student	Saying the two words as one whole word
	Blending syllables
Purpose	To determine if students can blend syllables to make a word
Explanation provided by instructor	I am going to say two parts of a word. I want you to put them together to make a whole word. For example, if I say, "sum - mer," you would say "summer."
Response required by student	Saying the syllables as one whole word.
	Blending phonemes
Purpose	To determine if students can blend individual sounds to make a word
Explanation provided by instructor	I am going to say some sounds. I want you to put the sounds together to make a word. For example, if I say, "/p/ /a/ /n/," you would say "pan."
Response required by student	Saying the whole word
	Segmenting a word into two words
Purpose	To determine if students can segment a word into two words
Explanation provided by instructor	I am going to say a word. I want you to break the word into two words. For example, if I say "buttermilk," you would say "butter, milk."
Response required by student	Segmenting the word and saying the two words
	Segmenting words into syllables
Purpose	To determine if students can segment a word into syllables
Explanation provided by instructor	I am going to say a word. I want you to break the word into smaller parts. For example, if I say "summer," you would say, "sum, mer."
Response required by student	Segmenting the word and saying the syllables.
	Segmenting words into phonemes
Purpose	To determine if students can break a word into its individual sounds.
Explanation provided by instructor	I am going to say a word. I want you to tell me each sound in the word. For example, if I say, "jot," you would say "/j/ /o/ /t/"
Response required by student	Saying the individual letter sounds in the target word
	Saying a word with a part or beginning sound missing
Purpose	To determine if students can delete the beginning part of a word to make a new word

Table 6--continued.

Explanation provided by instructor	I am going to ask you to say a word without saying a certain part of the word. For example, if I say, "Say 'cat' without saying /c/," you would say 'at.'
Response required by student	Deleting the beginning part of a word and saying the new word, according to instructions.
Saying a word with a final or middle sound missing	
Purpose	To determine if student can delete the final or middle sound from a word to make a new word
Explanation provided by instructor	I am going to say a word without saying the ending sound or middle sound of the word. For example, if I say, "Say 'lost' without saying /t/," you would say 'los.'
Response required by student	Deleting the final or middle sound in a word and saying the new word.
Phoneme reversal	
Purpose	To determine if students can reverse the order of two phonemes in a word to make a new word
Explanation provided by instructor	I am going to say a word. I want you to reverse the order of two sounds and say the new word. For example, for the word "top," I want you to switch places for /t/ and /p/. So you would tell me "pot."
Response required by student	Reversing the order of two phonemes and saying the new word.
Phoneme substitution	
Purpose	To determine if students can say a word if a sound is replaced by another sound
Explanation provided by instructor	I am going to say a word. I want you to remove one sound from that word and replace it with another sound and then say the new word. For example, if I say, "Say 'pit;' now remove the /p/ sound and put in a /l/ sound, you would say, 'lit.'
Response required by student	Saying the new word with the replaced sound

Reinforcement. To encourage student participation and effort during instructional sessions, a progress chart (See Appendix C) was maintained in a folder for each student. Students had opportunities to see their charts and evaluate their performance. Students were also provided verbal reinforcers (praise) during instruction.

Research Instrumentation

The research instruments that were used in this study included the screening measure, the pretest measures, and the posttest measures.

Screening Measure

The nature of the instruction suggested that the students for this study should be those students who had low levels of phonological awareness. Therefore, a screening instrument was administered to identify potential subjects. The screening instrument was the Lindamood Auditory Conceptualization Test (LAC Test) (Lindamood & Lindamood, 1971, 1979). This test was chosen because it had norms for older students (ages 11 and above), while other tests of phonological awareness do not.

Lindamood Auditory Conceptualization Test. The LAC test is an individualized test designed to measure auditory perception and conceptualization of speech sounds. (A copy of test items is included in Appendix C.) In this test, students use colored blocks to represent phonemes in either consonant sequences (e.g., /p/ /p/ /m/) or nonsense words in a series or chain (e.g., "Show me /a/"; "if that says /a/, show me /ap/"). The test contains a structured training process that involves left-to-right sequencing of the blocks and using one color to represent each different sound.

Reliability of the test was determined by pre/post-testing with alternate forms of the LAC test, on a sample of 52 students (four at each grade level, K-12). The test-retest reliability between Form A and Form B was +.96. With respect to validity, correlations of the LAC total test with the Wide Range Achievement Test combined Reading and Spelling were found to range from +.66 to +.81 at different grade levels, with an average of +.73.

The LAC test is scored using the following scoring procedure. One point was allotted for each correct response. (For category I-A and category I-B, students had to use the blocks to represent phonemes in consonant sequences and for category II, students had to make nonsense words with the blocks.) A total raw score was converted to a standard score to allow comparisons across grade levels. According to the norms of the test, for middle school students, the minimum performance score is 93. Those students who scored below 93 were selected for the study.

Pretest Measures

Pretest measures assessed word identification and phonological awareness skills. The Woodcock Reading Mastery - Revised (Woodcock, 1987) and the Comprehensive Test of Phonological Processes (Torgesen, Wagner, & Rashotte, 1999) were used for the pretest measures.

Word identification. The word identification test was administered to determine if students could read words without a context. The test also provided information about students' word reading levels. To assess word identification, the Woodcock Reading Mastery Test - Revised (WRMT-R) was administered. The word identification subtest of the WRMT-R required students to pronounce words in isolation. This subtest measured students' ability to read words on sight. Further, students could not rely on background information, because there was no context for the words (i.e., the words are not embedded in a sentence). For this subtest, raw scores were calculated and used for analyses.

Reliability and validity of the WRMT-R. The author provided data on the internal-consistency reliability of the WRMT-R. These data were provided separately for

grades 1, 3, 5, 8, and 11 and for college and adult groups. Reliabilities ranged from .8 to .9 for total test scores. Reliabilities were also calculated using the split-half procedure. Split-half reliability coefficients for the word identification subtest was .98. Concurrent validity data are provided for the total reading score of WRMT-R and total reading scores of 4 other batteries (Iowa Test of Basic Skills, Iowa Test of Educational Development, PIAT, and Woodcock-Johnson Reading Achievement). These correlations range from .78 to .92 for samples of 48 to 86 examinees. Correlations among the total score of WRMT-R and the total score of Woodcock-Johnson Reading Test were reported for grades 1 through 8. These correlations ranged from .60 to .91.

Phonological Awareness. To assess phonological awareness, the Comprehensive Test of Phonological Processes (CTOPP) was administered. The purpose of this test was to identify individuals who have deficits in phonological awareness skills. The CTOPP has the following subtests: elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, segmenting nonwords, sound matching, memory for digits, rapid color naming, rapid object naming, rapid digit naming, and rapid letter naming. The sound matching subtest was omitted, because it is used with 5 and 6 year olds. Five other subtests (memory for digits, rapid color naming, rapid object naming, rapid digit naming, and rapid letter naming) were omitted, because the intervention does not address those specific skills. The following subtests were administered: Elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, and segmenting nonwords. These subtests are described below.

1. Elision. The elision subtest measures the extent to which an individual can say a word, then say what is left after dropping out designated sounds. For example, the student is instructed, "Say bold." After repeating "bold," the student is told, "Now say bold without saying /b/." This subtest has 20 items.

2. Blending words. This 20-item subtest measures an individual's ability to combine sounds to form words. For example, the student is asked, "What word do these sounds make: "/t/-/oi/?" The correct response is the word "toy."

3. Nonword repetition. This subtest has 18 items, and measures an individual's ability to repeat nonwords that range in length from 3 to 15 sounds. For example, the student would repeat the word, "nigong."

4. Blending nonwords. This subtest (consisting of 18 items) measures an individual's ability to combine speech sounds to make nonwords. For example, the student is asked, "What made-up word do these sounds make: "/nim/ - /by/?" The correct response is "nimby."

5. Segmenting words. This subtest measures the ability to say the separate phonemes that make up a word. The student is told to repeat a word, then to say it one sound at a time. For example, if the examiner tells the student to say "beast" and then say it one sound at a time, the student would say, "/b/ /e/ /s/ /t/." The total number of items for this subtest is 20.

6. Segmenting nonwords. This subtest (20 items) measures an individual's ability to say the separate phonemes that make up a nonword. For example, if the student listens to the nonword, "ren," he / she would say "/r/ /e/ /n/."

7. Phoneme reversal. This 18-item subtest measures the extent to which an individual can reorder speech sounds to form words. For example, after listening to the sounds, "ood," the student is instructed to repeat "ood" and then to say "ood" backwards. The correct response is "do."

Raw scores were obtained for each subtest and then summed to obtain a total raw score. This score will be used for analyses.

Reliability and validity of the CTOPP. The authors of the CTOPP reported test-retest reliabilities for each of the subtests. These reliabilities are shown in Table 7. The authors also reported concurrent validity for the CTOPP. The subtests of the CTOPP were correlated with the word identification and word analysis subtests of the WRMT-R. Some of the subtests of the CTOPP were also correlated with the Lindamood Auditory Conceptualization Test to further establish the validity. Information about validity is summarized in table 8..

Table 7

Test retest reliabilities for the CTOPP subtests

Subtest	Reliability
Elision	.79
Blending words	.72
Nonword repetition	.75
Rapid letter naming	.72
Phoneme reversal	.79
Blending nonwords	.77
Segmenting words	.79
Segmenting nonwords	.86

Table 8

Concurrent validity for the CTOPP

CTOPP subtests	WRMT-R		Lindamood Auditory Conceptualization Test
	Word Identification	Word Analysis	
Elision	.53	.74	.75
Blending words	.16	.32	.58
Memory for digits	.46	.36	.48
Rapid digit naming	.57	.70	.51
Nonword repetition	.22	.40	.41
Rapid letter naming	.52	.65	.49

Mid-test and Posttest Measures

A mid-test (test 2) was administered to both groups after instruction was completed for group A. The word identification and the phonological awareness tests were used for the mid-test. A posttest (test 3) was administered to both groups after group B completed instruction. The posttest comprised the same measures as the mid-test.

Experimental Design

A within group repeated measures design was used for this study. At the outset, all students were given the pretest. Then the sample was split into two equivalent groups, A and B, based on scores on the Lindamood Auditory Conceptualization Test. Instruction began for group A alone. After instruction for group A was completed, both

groups were given the mid-test (test 2). At this point, instruction began for group B. After group B completed instruction, both groups were given the posttest (test 3).

Treatment of the Data

The data were analyzed to determine if any significant differences existed between the two groups on any of the measures. Baseline data, including the mean for each group on each of the pretest measures were collected at the outset of the study. The pretest means were compared to determine if there were any significant differences between the groups. ANOVAs were conducted to compare group means on the word identification subtest of the Woodcock and CTOPP separately. These comparisons told us if instruction had an effect on performance scores. Table 9 contains an illustration of the comparisons to be made during the analysis for each hypothesis. Dependent t-tests were also conducted to examine more closely the differences between cell means (for the CTOPP).

Table 9

Design for Testing the Null Hypotheses

Dependent Measures	Group A	Group B
	Midtest (Test 2)	Midtest (Test 2)
CTOPP	H_1: There will be no statistically significant difference between the groups on measures of phonological awareness.	
Word Identification (Woodcock)	H_2: There will be no statistically significant difference between the groups on a measure of word identification.	

CHAPTER IV
RESULTS

Introduction

The purpose of this study was to investigate the effects of phonological awareness instruction for middle school students who have been identified as having phonological awareness deficits. Two hypotheses were formulated and tested. The general question of the study was as follows: Does phonological awareness instruction influence the acquisition of phonological awareness and word identification? To investigate this question, 40 middle school students with phonological awareness deficits were split into two groups, A and B. At the outset, both groups were given the pretest. Then, group A began intervention. After intervention was completed for group A, both groups were given a second test (test 2). At this point, group B was provided instruction. After group B completed intervention, both groups were given test 3. The effects of the instruction on phonological awareness skills and word identification skills of the students in both groups were measured and compared.

This chapter contains the results of the statistical analyses of the data from this study. First, the reliability of instructional procedures is explained. Second, the statistical model used to analyze the data is presented, and the results of the data analyses are discussed. Finally, the hypotheses are examined in light of the statistical results.

Reliability of Instructional Procedures

Procedures were implemented to ensure the reliability of instructional procedures throughout the duration of the study. Because two groups were used, it was necessary to ensure that instructional procedures for both groups were consistent.

Procedural Reliability

The researcher conducted the instruction for both groups at all times. In some situations, having the researcher as the instructor for two treatment groups may introduce a bias, because the researcher is not blind to the treatment conditions and outcomes for the groups. However, in this study, the design itself controlled for such a bias. The research design required both treatment groups to receive exactly the same instructional program and to make similar gains after instruction. Further, the two groups were not instructed at the same time. Group B began intervention only after group A completed intervention. Thus, the chances are less that a bias on the instructor's part could have facilitated one group to perform higher than the other group.

With respect to the instructional program, scripted lessons were used for both groups. Consequently, everyone listened to the same explanations, introductions, and examples. The instructor also made sure that all students in both groups completed the same number of lessons. To further ensure fidelity of treatment, the researcher had planned to be formally observed by a masters student. The purpose of these observations was to ensure the consistent implementation of the instructional program. However, due to circumstances beyond the researcher's control, these observations were not conducted.

Statistical Analysis of the Data

Statistical analyses were conducted to ensure the initial equivalence of the two groups. This section presents data on the ages, gender, and race of the participants of the study. In addition, results of the statistical analyses are examined to compare the effects of training on the phonological awareness and word identification skills of the students.

Equivalence of the Intervention Groups

Several analyses were completed to determine if there were any preexisting differences between group A and group B. The mean age for both groups was the same (12.9). A chi-square (χ^2) test was used to compare the two groups by gender. The χ^2 revealed no differences (at the 0.05 level) between the groups for gender ($\chi^2 = 1.6$, $p = 0.20$). Table 10 provides a summary of the distribution of subjects into groups by gender, race, and age.

Table 10

Distribution of Subjects by Gender, Race, and Age

Group	Gender		Race			Mean Age
	Female	Male	Caucasian	African American	Hispanic	
A	8	12	9	10	1	12.90
B	12	8	2	17	1	12.90

The means of the pretest scores for the two groups were calculated. Using t-tests, the pretest scores of the groups were compared to determine if any differences between the groups existed. No significant differences between the two groups' pretest means were found. Table 11 includes the means and standard deviations of the Lindamood

Auditory Conceptualization Test (LACT) for both groups. This test was administered at the beginning of the study to select the students. It was also used to match the students before assigning them to the two treatment groups.

Table 11

Means and Standard Deviations for the LACT

Dependent Measure	Group A (n=20) Mean (SD)	Group B (n=20) Mean (SD)	t	df	p
Lindamood Auditory Conceptualization Test	49.00 (13.69)	49.35 (13.45)	0.09	19	.9302

Descriptive Summary of Pretest to Posttest Data

Table 12 and 13 present the means and standard deviations of the data collected in the study by group. (Average scores for each of the subtests of the CTOPP for the pretest, midtest, and posttest are presented in Appendix D. The number of administrations for each lesson is presented in Appendix E and the student's scores on each lesson is presented in Appendix F). Table 12 presents the means and standard deviations for the two groups on the word identification subtest of the Woodcock, and Table 13 presents the means and standard deviations for the groups on the CTOPP.

Table 12

Means and Standard Deviations of Groups A and B on the Woodcock

Group	Pretest	Midtest (Test 2)	Posttest (Test 3)	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
A	41.35 (6.55)	43.20 (7.05)	44.95 (6.78)	43.17 (6.84)
B	40.45 (7.05)	41.4 (7.21)	42.7 (6.57)	41.42 (6.89)
Total Mean (SD)	40.9 (6.73)	42.3 (7.09)	43.83 (6.69)	

Table 13

Means and Standard Deviations of Groups A and B on the CTOPP

Group	Pretest	Midtest (Test 2)	Posttest (Test 3)	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
A	67.35 (13.79)	94.65 (7.11)	94.7 (7.68)	85.57 (16.29)
B	63.75 (10.45)	67.85 (7.18)	96.65 (5.53)	76.08 (16.72)
Total Mean (SD)	65.55 (12.21)	81.25 (15.3)	95.68 (6.68)	

Inferential Analysis of the Data

Several statistical analyses of dependent measures were conducted to compare the effects of instruction on the phonological awareness skills and word identification skills of the middle school students. First, a two-within factors ANOVA was conducted to compare the two groups in terms of phonological awareness and word identification skills. (The within-factors ANOVA approach was used because the two groups were matched on a variable, making the groups dependent on each other). Two ANOVAs were conducted for the word identification subtest and for the CTOPP separately.

With respect to the word identification subtest, the ANOVA did not reveal a significant interaction effect. However, there was significant main effect for occasion. Hence, the marginal means for occasion (pretest, midtest, and posttest means) were compared using dependent t-tests. (Dependent t-tests were used for the follow-up tests, because the two groups were dependent on each other). With respect to the CTOPP, the ANOVA results revealed a significant interaction effect. Hence, the cell means were examined by conducting follow-up t-tests. The follow-up tests included tests for group within occasion and occasion within group. The following section describes the results of the ANOVA for the word identification and for the CTOPP and the results of the follow-up t-tests.

Results of the ANOVA. Two ANOVAs were conducted for the word identification subtest and for the CTOPP. This section first describes the results of the ANOVA for the word identification and then the results of the ANOVA for the CTOPP. Table 14 presents the ANOVA source table for the word identification subtest of the Woodcock.

Table 14

Comparison of the Word Identification Subtest (Woodcock) by Group

Source	df	SS	MS	f	p
Group (G)	1	81.68	81.68	0.61	0.4429
Error (SG)	19	2526.83	132.99		
Occasion (O)	2	171.22	85.61	27.01	0.0001*
Error (SO)	38	120.45	3.17		
Interaction (G X O)	2	9.45	4.73	1.88	0.1666
Error (SGO)	38	95.55	2.51		

* significant at the $p < 0.05$ level.

The results of the ANOVA revealed that there was no interaction effect and no significant difference between the two groups in terms of word identification, as measured by the Woodcock. However, the main effect for occasion was significant. To determine exactly where the differences were, dependent t-tests were conducted for the marginal means for occasion (i.e., pretest, midtest, and posttest means). The following formula was used to calculate the observed t value:

$$t_{observed} = D / S_D$$

In the above formula, $t_{observed}$ is the observed t value; D is the mean of differences between the raw scores, and S_D is the standard error of differences. This formula was used for all the follow-up t-tests. The Bonferroni procedure was used to set the significance level for the follow-up t-tests to control for Type 1 error. The α level (.05) was divided by 3, because there were three follow-up tests.

Table 15 presents the comparison between the pretest and midtest scores on the word identification subtest of Woodcock; Table 16 shows the comparison between

pretest scores and posttest scores; and Table 17 presents the comparison between the midtest and posttest scores. Results of the t-tests indicated that the means of the posttest and midtest scores were significantly higher than the pretest mean, and the posttest mean was significantly greater than the midtest mean. These results imply that the groups improved their word identification skills over time. However, these results do not seem to have practical significance because the students' grade levels for word identification at the posttest were the same as their grade levels at the pretest (i.e., the grade levels remained below the fourth grade).

Table 15

Comparing Pretest and Midtest Marginal Means on Woodcock

Dependent Measure	Pretest	Midtest (Test 2)	df	t	Prob >|t|
Woodcock	40.90	42.30	38	4.33	0.0004*

* significant at the $p < .05/3$ (0.016) level

Table 16

Comparing Pretest and Posttest Marginal Means on Woodcock

Dependent Measure	Pretest	Posttest (Test 3)	df	t	Prob >|t|
Woodcock	40.90	43.83	38	6.81	0.0001*

* significant at the $p < .05/3$ (0.016) level

Table 17

Comparing Midtest and Posttest Marginal Means on Woodcock

Dependent Measure	Midtest (Test 2)	Posttest (Test 3)	df	t	Prob >|t|
Woodcock	42.30	43.83	38	3.54	0.0022*

* significant at the p < .05/3 (0.016) level

A two-within-factors ANOVA was also used to compare the groups' performance on the CTOPP. Table 18 presents the ANOVA source table for the CTOPP. Results of the ANOVA indicated (1) an interaction effect, (2) significant main effect for groups, and (3) significant main effect for occasion (i.e., the two groups made significant gains over time). Follow-up t-tests revealed further information about group differences and gains from pretests to posttests.

Table 18

Comparison of Phonological Awareness Skills (CTOPP) by Group

Source	df	SS	MS	f	p
Group (G)	1	2698.0	2698.0	41.96	0.0001*
Error (SG)	19	1221.83	64.31		
Occasion (O)	2	18161.15	9080.58	217.45	0.0001*
Error (SO)	38	1586.85	41.76		
Interaction (G X O)	2	4652.02	2326.0	140.15	0.0001*
Error (SGO)	38	630.65	16.60		

* significant at the p < 0.05 level.

The within-subjects ANOVA was useful in determining if there were overall group effects and interaction effects for the word identification subtest and the CTOPP.

In order to look more closely at group differences, simple effects were calculated to examine group within occasion and occasion within group. The formula described on page 96 was used for the follow-up t-tests. With respect to the significance level, the Bonferroni procedure was used to control for Type 1 error. The significance level for the follow-up tests was set at .05/9 (.0056). The α level (.05) was divided by 9, because there were nine follow-up tests. The following t-tests were conducted to examine the effects of group with occasion:

1. A v. B on the pretest
2. A v. B on the midtest
3. A v. B on the posttest

To examine the effects of occasion within groups, the following t-tests were conducted:

1. Pretest v. midtest scores of group A
2. Pretest v. posttest scores of group A
3. Midtest v. posttest scores of group A
4. Pretest v. midtest scores of group B
5. Pretest v. posttest scores of group B
6. Midtest v. posttest scores of group B

The results of each of the t-tests are described. First, both groups are compared in terms of the pretest, midtest (test 2), and posttests on the CTOPP. Then, each group is individually examined for gains from occasion to occasion.

Groups within occasion. Table 19 provides a summary of the comparison of the two groups on the pretest, midtest, and posttest. When comparing the pretest scores of groups, A and B on the CTOPP, results indicated that there was no significant difference

between the groups.. On the midtest, group A significantly outperformed group B and on the posttest, there was no significant difference between the scores of group A and group B.

Table 19

Comparing Groups Within Occasion for CTOPP

Dependent Measure	Mean of Group A	Mean of Group B	df	t	Prob >|t|
CTOPP Pretest	67.35	63.75	19	1.73	0.1002
CTOPP Midtest	94.65	67.85	19	14.93	0.0001*
CTOPP Posttest	94.70	96.65	19	-1.32	0.2030

* significant at the $p < 0.05/9$ (0.006) level.

Occasion within group for group A. The pretest scores were compared to the midtest (test 2) and posttest scores of group A to determine if scores on CTOPP increased after intervention. Table 20 presents the t-test results comparing the pretest and midtest, pretest and posttest, and midtest and posttest scores of group A. These tests indicate that group A had significantly higher scores on both the midtest and the posttest compared to the pretest. Comparing midtest and posttest, there was no significant difference.

Table 20

Comparing Occasion Within Group for Group A

Dependent Measure	Pretest	Midtest (Test 2)	df	t	Prob >|t|
CTOPP	67.35	94.65	19	-11.60	0.0001*

* significant at the $p < 0.05/9$ (0.006) level.

Table 20--continued.

Dependent Measure	Pretest	Posttest	df	t	Prob >|t|
CTOPP	67.35	94.70	19	-10.84	0.0001*
Dependent Measure	Midtest	Posttest	df	t	Prob >|t|
CTOPP	94.65	94.70	19	0.05	0.9576

* significant at the $p < 0.05/9$ (0.006) level.

Occasion within group for group B. The pretest and midtest scores on the CTOPP were compared for group B. The scores were not expected to be different, because intervention began for group B only after the midtest. The pretest and posttest scores were compared to determine if there were overall gains in phonological awareness skills. Results indicated that the midtest score was significantly higher than the pretest score and posttest score was significantly higher than the pretest. The midtest and posttest scores of group B were compared to determine if intervention had an effect, and if posttest scores were significantly higher than the midtest scores. Results indicated that on the CTOPP, group B scored significantly higher on the posttest than on the midtest.

Table 21

Comparing Occasion Within Group for Group B

Dependent Measure	Pretest	Midtest (Test 2)	df	t	Prob >|t|
CTOPP	63.75	67.85	19	-3.44	0.0027*

* significant at the $p < 0.05/9$ (0.006) level.

Table 21--continued.

Dependent Measure	Pretest	Posttest	df	t	Prob >|t|
CTOPP	63.75	96.65	19	-13.24	0.0001*
Dependent Measure	Midtest (Test 2)	Posttest	df	t	Prob >|t|
CTOPP	67.85	96.65	19	-33.97	0.0001*

* significant at the $p < 0.05/9$ (0.006) level.

In addition to the follow-up t-tests, effect sizes were calculated by comparing (a) pretest and midtest scores of group B and (b) midtest and posttest scores of group B. The effect sizes were calculated in an attempt to explain an unexpected result. The statistical results indicated that both groups had significantly higher midtest scores than pretest scores. For group A, it was expected that the midtest score would be higher than the pretest score, because group A had begun intervention after the pretest. However, group B was not expected to have higher a midtest score compared to the pretest score, because group B had not begun intervention. Because group B had a significantly higher midtest score compared to the pretest score, it may be difficult to conclude that the treatment was having an effect on group B. By comparing the magnitude of effects of (a) pretest and midtest and (b) midtest and posttest, it may be possible to conclude that the treatment led to the significantly higher posttest score. The following formula was used to calculate the effect sizes:

$$\text{Effect Size} = \frac{Y_1 - Y_2}{S_p}$$

In the formula, Y_1 and Y_2 are the means to be compared, and S_p is the pooled standard deviation. Table 22 presents the effect size comparing the pretest and midtest means of group B and Table 23 presents the effect size comparing the midtest and posttest means of group B.

Table 22

Effect Size of Pretest and Midtest Score Comparison of group B

Group B		
Pretest Mean (SD)	Midtest Mean (SD)	Effect Size
63.75 (10.45)	67.85 (7.18)	0.46

Table 23

Effect Size of Midtest and Posttest score comparison of group B

Group B		
Midtest Mean (SD)	Posttest Mean (SD)	Effect Size
67.85 (7.18)	96.65 (5.53)	4.49

According to the results, for group B, the effect size comparing pretest and midtest scores was .46 and the effect size comparing the midtest and posttest scores was 4.49. These effect sizes have important significance to the results of this study. A detailed discussion of the effect sizes is provided in Chapter V.

To summarize, results of the ANOVA for the word identification subtest did not reveal a significant interaction effect. A significant main effect was found only for occasion within groups. Follow-up t-tests were used to compare the marginal means for occasion (i.e., the pretest, midtest, and posttest means). The t-test results revealed that for both groups, the mean midtest score was significantly higher than the mean pretest score, and the mean posttest score was significantly higher than the mean pretest and midtest scores.

For the CTOPP, the ANOVA results revealed a significant interaction effect. Hence, follow-up t-tests were conducted to examine differences between the cell means. The two groups did not differ significantly on the pretest and posttest. However, group A had significantly higher midtest scores than group B on the CTOPP. Group A also had a significantly higher CTOPP midtest score compared to the pretest. Both groups had significantly higher posttest scores compared to their pretest scores. One finding that tends to confound the results was that group B had significantly higher midtest scores than the pretest scores. Finally, there was no significant difference between the midtest and posttest scores of group A, indicating that this group was able to maintain gains on the phonological awareness measure. In the following section, these statistical results are examined in light of the hypotheses.

Summary Of The Hypotheses And Results

Two hypotheses were constructed to test the effects of group on the phonological awareness and word recognition skills of the participants. The results of the statistical analyses designed to test each hypothesis are discussed in this section.

The research design allowed the midtest to be a direct test of the hypotheses. According to the design, the treatment effects were expected to be demonstrated at the midtest. While group A began intervention after the pretest, group B did not begin intervention until after the midtest. Hence, group A was expected to have higher midtest scores than group B on both measures.

Hypothesis 1

Students who receive phonological awareness instruction will not outperform students who do not receive instruction on measures of phonological awareness, including elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, and segmenting nonwords.

The ANOVA for the CTOPP measure revealed a significant group and occasion interaction effect. Hence, follow-up t-tests were conducted to examine simple effects of groups within occasion and occasion within groups. The t-test revealed that group A had significantly higher midtest scores than group B on the CTOPP. Thus, for phonological awareness, statistical analyses resulted in the rejection of the null hypothesis.

Hypothesis 2

Students who receive phonological awareness instruction will not outperform students who do not receive instruction on a measure of word identification.

The ANOVA for word identification indicated that there was no significant interaction effect. Also, results did not indicate a significant group main effect. This implied that there was no significant difference between groups A and B on word identification. The lack of a statistically significant difference resulted in a failure to reject the null hypothesis.

The results of the statistical analyses of the data from this study have been presented in this chapter. Methods used to ensure the reliability of instructional procedures were described and demographic data presented to demonstrate initial equivalence of the two groups. The statistical model used to analyze the data was explained, the results of the data analysis were presented, and these results were examined in light of the hypotheses. The following chapter provides a detailed discussion of the results.

CHAPTER V
DISCUSSION

Over the last two decades, reading research has confirmed the importance of phonological awareness in the acquisition of reading skills (Shankweiler & Liberman, 1988; Wagner & Torgesen, 1987). Longitudinal studies and experimental intervention have concluded that phonological awareness reliably predicts reading skills several years later, and that instruction could improve phonological awareness skills (Ball & Blachman, 1991; Juel, 1988; Vellutino & Scanlon, 1987). Consequently, many researchers seem to suggest a phonological model of beginning reading (e.g, Adams, 1990; Shaywitz, 1996; Snowling, 1995). The phonological model of reading supports the idea that for reading to occur, phonological awareness skills have to be called into play.

Because research has established that phonological awareness is crucial to reading success, much attention has been devoted to the training of phonological awareness in children with and without deficits in phonological awareness. Researchers have explored a variety of intervention procedures for phonological awareness training (e.g., Ball & Blachman, 1991; Bradley & Bryant, 1983; O'Connor, Slocum, & Jenkins, 1995; Torgesen, Morgan, & Davis, 1992). A huge body of experimental research has involved elementary school children, and findings have concluded that children who were trained in phonological awareness showed improvements in phonological awareness skills and word recognition and spelling. Further, those training studies that had a follow-up

component showed evidence that phonological awareness skills tend to be maintained over an extended period of time (e.g., Lundberg, Frost, & Peterson, 1988).

The present study aimed to build on existing research by extending research findings to older children who have deficits in phonological awareness. Previous research has pointed out that older students also have reading deficits (Deshler, Warner, Schumaker, & Alley, 1983; Reith & Polsgrove, 1994). If the phonological model is valid, many of the reading deficits that older children have may be explained by phonological awareness deficits. Consequently, targeting phonological awareness skills during intervention should improve word recognition skills. The purpose of the present study was to determine if older students (at the middle school level) who were identified as having phonological awareness deficits could improve their phonological awareness skills after instruction, and if these skills could impact their word recognition.

The objectives of the study were as follows:

1. To determine if instruction in phonological awareness would improve phonological awareness skills in middle school students who have reading problems.

2. To determine if instruction in phonological awareness would improve word recognition skills in middle school students who have reading problems.

The study was conducted using a within-group repeated measures design. Forty students were split into two groups, A and B. Group A first received instruction, and after instruction was completed, instruction began for group B. Instructional procedures were the same for both groups. Two hypotheses were constructed and tested. Dependent measures were statistically examined to compare the effects of group on phonological awareness and word recognition. Results of the study indicated that group A

significantly outperformed group B on the phonological awareness measure (CTOPP). However, the groups did not differ significantly on the word identification measure. This finding led the researcher to conclude that the intervention did impact phonological awareness skills. However, it was difficult to make conclusions about the impact of the intervention on word identification skills.

In the following sections, conclusions of the study are presented and results are compared to previous research findings. Limitations of the study are acknowledged, implications for practice are discussed, and suggestions for future research are proposed.

Discussion of Findings

In this section, conclusions based on the results of the study are presented. The results of this study are then compared with the findings of prior research in phonological awareness. Areas of consistency and inconsistency between the results of this study and previous research are reported, including tentative explanations for the inconsistencies.

Conclusions Based On Statistical Results

Several statistical analyses of dependent measures were conducted to compare the effects of instruction on the phonological awareness skills and word identification skills of the participants in the study. First, a two-within factors ANOVA was conducted to compare the two groups in terms of phonological awareness and word identification skills. For the CTOPP measure, the ANOVA revealed a significant interaction. Hence, follow-up *t*-tests were conducted to examine the cell means. The ANOVA and t-tests led to the following results: (a) group A had significantly higher midtest scores on the CTOPP compared to group B, (b) group A showed maintenance with respect to phonological awareness, and (c) both groups had significantly higher posttest scores

compared to pretest scores for both measures, and (d) absence of group effect for word identification. These results along with their conclusions will be further examined.

Group effect on the midtest for the CTOPP. The ANOVA (described in Chapter IV) revealed a significant interaction for the CTOPP measure. Hence, follow-up t-tests were conducted to examine the cell means. When the midtest scores on the CTOPP for both groups were compared, results revealed that group A had significantly higher scores than group B. This result led to a rejection of Hypothesis 1 (students who receive phonological awareness instruction will not outperform students who do not receive instruction on measures of phonological awareness). The significant group effect implies that the intervention led to an improvement of the students' phonological awareness skills (including elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, and segmenting nonwords). Hence, it is reasonable to conclude that phonological awareness intervention impacts the phonological awareness skills of middle school students who have deficits in phonological awareness.

Maintenance of skills. Group A was given a second posttest (approximately 4 weeks after the midtest). The purpose of this second posttest was to determine if score gains would be maintained on this posttest. Results indicated that for group A there was no significant difference between posttest and midtest on phonological awareness. This implies that the students in group A retained the skills that they were taught during the intervention. The short duration of this study may make it impossible to conclude maintenance of skills beyond 4 weeks. However, results are promising, considering that the students in this study were far below grade level on phonological awareness skills at the beginning of the study.

Significant gains from pretest to posttest. For the word identification measure, the ANOVA revealed a significant main effect for occasion. Follow-up t-tests for the marginal means for occasion revealed that together both groups had significantly higher posttest and midtest scores compared to the pretest, and significantly higher posttest scores compared to the midtest scores. These results indicate that over time, both groups seemed to improve their word identification skills. The pretest scores indicated that the students in the study were approximately at the third grade level with respect to word identification. The posttest scores on the Woodcock indicated that their reading levels did not change. However, both groups had significantly higher scores compared to the pretest.

Similarly, posttest scores on phonological awareness were significantly higher than pretest scores for both groups. For group B, the posttest score was significantly higher than the midtest, indicating that after instruction the phonological awareness skills of this group improved significantly. The CTOPP pretest scores for both groups indicated that the grade levels of the students ranged from second grade to fourth grade on the subtests (except for blending nonwords which indicated grade level 9). However, on the posttest, grade levels ranged from 3 to 9 on the individual subtests for both groups. The most dramatic score increases were noticed for segmenting words, segmenting nonwords, and phoneme reversal. For segmenting words and segmenting nonwords, pretest scores indicated third grade level for both groups. The posttest scores indicated ninth-grade level for segmenting words and sixth-grade level for segmenting nonwords. For phoneme reversal, pretest scores indicated a fourth grade level for the two groups. However, posttest score indicated ninth-grade level.

Absence of group effect for word identification. In this study, the students did not seem to transfer phonological awareness skills to word identification. Failure to transfer phonological awareness skills to word identification was indicated by lack of statistical significance between the groups. In this study, a lack of transfer may have been the result of several factors including the severity of reading problems of the participants, age of the participants, nature of the instructional program, and nature of the word identification measure. These factors are examined more closely.

1. Severity of reading problems. The sample in this study consisted of middle school students who were identified as having learning disabilities. In addition, nearly all the participants were reading below the fourth grade level. Students with severe reading problems may differ from typical learners in their ability to transfer phonological skills across tasks. Research suggests that students with learning disabilities have problems transferring their learning (e.g., Alley, Deshler, Clark, Schumaker, & Warner, 1983). This difficulty in transfer of learning may have prevented many of the participants in this study from transferring phonological awareness skills to word identification.

2. Age of students. The students in this study were at the middle school level, with an average age of 12.9. These students seemed to have experienced many years of reading problems. The severity of the students' reading problems combined with their age may have led to difficulties in transferring phonological awareness skills to word identification. Hence, older students with reading problems may require more intensive and longer instructional programs than younger children with reading problems.

Research also suggests that children with learning disabilities acquire skills more slowly than typical learners (Sugden, 1989). Hence, longer intervention programs may

be required to ensure that students have attained mastery and transfer. Although the instructional program impacted phonological awareness skills, the duration may not have been sufficient to influence word identification. Sugden (1989) further asserts that children with learning disabilities find it difficult to transfer their learning to new situations. Thus, it is important to design an appropriate instructional program that enables students with disabilities to transfer their learning to another context (Brown & Campione, 1986; Pressley, et al., 1987).

3. Nature of the instructional program. The instructional program used in this study (Mercer & Campbell, 1998) was designed specifically to develop phonological awareness skills. Students in the study used only their auditory skills to learn the various phonological awareness skills with no opportunity to apply these skills to the reading of words. Though some research has demonstrated that phonological awareness instruction alone improves reading and spelling skills (e.g., Hurford et al., 1994), older students with reading problems may need more explicit instruction involving instruction in word identification strategies. Previous research seems to suggest that children show transfer from phonological awareness to word identification if a component of letter-sound correspondences is included, along with instruction in phonological awareness skills (e.g., Ball & Blachman, 1988; Brady, Fowler, Stone, & Winbury, 1994; Vellutino & Scanlon, 1987).

4. Nature of the word identification measure. The word identification subtest of the Woodcock requires students to identify isolated words. Though some of the words can be sounded out (e.g., "red"), a majority of the words are not conducive to sounding out (e.g., "garage.") (Woodcock, 1987). Hence, the students may have found it difficult

to apply their phonological awareness skills to sound out many of the words. Because the words in the test were not conducive to sounding out, it may appear that students did not make the transfer from phonological awareness skills to word identification. In this study, the word identification subtest of the Woodcock was chosen primarily because previous studies used this test as a dependent measure. Further, the test has norms and grade levels for older students. A more sensitive measure of word identification that includes phonetically regular words may help to determine if instruction in phonological awareness skills leads to improvement in word identification.

To summarize, it seems that transfer of learning may have occurred if students were provided training in letter-sound correspondences and word identification along with training in phonological awareness skills. Further, the participants in this study had severe reading problems and may have experienced years of reading failure. Thus, intervention may have been more effective if students were provided explicit training (for a longer period of time) rather than expecting them to transfer skills on their own. Finally, selecting a more sensitive dependent measure for word identification may have provided more information about the impact of phonological awareness instruction for word identification.

In addition to the above findings, results revealed two unexpected outcomes. One outcome was that group B had a significantly higher CTOPP midtest score compared to the pretest score. This was surprising, because group B began intervention only after the midtest. The second outcome was that for both groups the word identification score increased significantly over time. At the beginning of the study, it was expected that only

group A would show gains from pretest to midtest, but results revealed that group B also made significant gains from pretest to midtest.

One possible explanation for the above findings is that the participants in this study were already receiving instruction in word recognition and word attack skills in their classrooms. Though reading instruction varied across schools and classrooms, most students received instruction in phonics, word recognition, word attack, and comprehension skills. This ongoing classroom instruction could explain the significant gains over time for word identification and the significantly higher midtest score for group B. Another explanation could be familiarity with the test. Students in group B may have become familiar with the test items during the pretest and midtest. Thus, practice with the test may have led to the score increase in the midtest.

In order to determine if treatment had an effect on group B, the effect size comparing midtest and posttest (4.49) was compared to the effect size comparing pretest and midtest (.46). These effect sizes indicate that for group B, the posttest scores were higher by 4.49 standard deviations compared to the midtest (nearly 10 times higher). However, the midtest scores seemed to improve only about a half standard deviation compared to the pretest scores. If the treatment did not have an effect, group B may not have had such a dramatic score increase at the posttest. Hence, it is reasonable to conclude that the significantly higher posttest scores of group B, compared to the midtest scores was as a result of the treatment.

The effect sizes do not explain the significantly higher midtest score for group B (compared to the pretest). However, by comparing the index of performance of group B

at the posttest and at the midtest level, it is reasonable to conclude that the significant score increase at the posttest level for group B was due to the treatment.

Despite some of the ambiguous results, some of the major conclusions of this study are similar to those made by previous research studies. The following section describes some of the areas of consistency with prior research.

Areas of Consistency With Previous Research

Previous research strongly suggests the importance of phonological awareness instruction and its impact on improving many of the subskills of phonological awareness (e.g., Ball & Blachman, 1988; Hurford et al., 1994; Torgesen, Morgan, & Davis, 1992; Williams, 1980). In the review of literature (described in Chapter II), a majority of the studies included participants in kindergarten and first grade. However, the findings of those studies are similar to the findings of this study. Some of the areas of similarity are: (a) it is possible to teach phonological awareness skills to older students with severe phonological awareness deficits, (b) phonological awareness instruction can lead to significant improvement of phonological awareness skills, and (c) phonological awareness skills are maintained over time. Each of these areas is discussed further.

Teaching older students with phonological awareness deficits. The review of literature revealed two studies that involved older students. Both studies concluded that older students with phonological awareness deficits can improve their phonological awareness skills after instruction (e.g., Vellutino & Scanlon, 1987; Williams, 1980). The findings of this study are in agreement with previous research. The participants in this study had severe phonological awareness deficits. However, these students were able to learn the phonological awareness skills presented in the intervention, despite their

deficits. This is an important conclusion because it provides hope for practitioners that older students with deficits can significantly improve their phonological awareness skills and ultimately impact reading achievement in a positive way.

Significant improvement in phonological awareness. Results of this study provided evidence that group A had significantly higher midtest scores than group B on the CTOPP. Hence, intervention was effective in improving phonological awareness skills (including elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, and segmenting nonwords). This result is consistent with results of previous intervention studies (Ball & Blachman, 1991; Hurford et al., 1994; Torgesen, Morgan, & Davis, 1992; Vellutino & Scanlon 1987; Williams, 1980).

In addition to group effect, both groups showed significant gains from pretest to posttest (i.e., posttest scores were significantly higher than pretest scores). This finding is similar to results of previous research, indicating that students tend to improve in phonological awareness skills after instruction (e.g., Ball & Blachman, 1991; O'Connor, Jenkins, Leicester, & Slocum, 1993; Torgesen, Morgan, & Davis, 1992; Vellutino & Scanlon, 1987; Williams, 1980). Because posttest scores were significantly higher than pretest scores on phonological awareness, it may be reasonable to conclude that the intervention did impact students' phonological awareness skills.

Maintenance of skills. In this study, results indicated that group A showed maintenance of phonological awareness skills over time. These results are similar to previous findings that phonological awareness skills, once learned, tend to be maintained over a period of time (e.g., Lundberg, Frost, & Peterson, 1988; McGuinness,

McGuinness, & Donohue, 1995). More longitudinal studies involving older students may make this finding more conclusive.

It is encouraging to note similar research findings to those of previous studies. These findings could lead one to conclude that phonological awareness instruction is instrumental in improving phonological awareness skills in older students. However, this study did not result in some of the findings that were revealed in previous research studies. The following section describes some of the areas of contrast with prior research.

Areas Of Contrast With Previous Research

Previous research on phonological awareness intervention indicated that phonological awareness skills enabled word identification and spelling (e.g., Ball & Blachman, 1988, 1991; Bradley & Bryant, 1985; McGuinness, McGuinness, & Donohue, 1995; O'Connor, Slocum, & Jenkins, 1995; Williams, 1980). However, results of this study revealed that there was no significant difference between the two groups on the word identification subtest. This implies that training in phonological awareness may not have had an impact on word identification. This result tends to go against what previous studies have found about the effects of phonological skills on word identification.

An important difference between this study and some of the previous studies may explain the differences in research findings. Many earlier studies included letter-sound correspondences and decoding training in their intervention. Students were trained to identify the sounds associated with each letter and to read new combinations of sounds. This word identification training along with phonological awareness training may have helped students in their word recognition skills. This study, however, focused only on

training phonological awareness skills. The intervention did not have a component of letter-sound correspondences of word identification training. With training only in phonological awareness, the participants in this study may have found it difficult to transfer these phonological awareness skills to word reading.

In summary, it is difficult to draw conclusions regarding the effects of phonological awareness instruction. Consistent with expectations based on previous research, instruction in phonological awareness resulted in significantly higher increases in phonological awareness skills (elision, blending words, nonword repetition, phoneme reversal, blending nonwords, segmenting words, and segmenting nonwords). However, in contrast to the results of previous research, group A did not significantly outperform group B on word identification. Thus, intervention may not have had an impact on word identification skills.

Some of the results of this study may have been influenced by many factors difficult to control. These factors may have confounded the results of the study. In the following section, the limitations of the present study are discussed. These limitations could serve future researchers in their plans to study phonological awareness instruction for older students.

Limitations of the Study

This study had several limitations. The most significant limitation was time. The short duration of the study may not have been sufficient to facilitate transfer from phonological awareness skills to word identification skills. The students in the study were identified as having reading problems and phonological awareness deficits. Hence, these students may have needed some more time to acquire and transfer skills. Although

the instructional program impacted phonological awareness skills, it did not seem to influence word identification. Additional instructional sessions may have enabled transfer. Further, the instructional program did not include letter-sound correspondences or word recognition training. Word recognition training may have produced statistical significance between the groups.

Another limitation of this study is generalizability. The results of the study may not be generalizable to younger students who have phonological awareness deficits.

The participants in this study had already received instruction in phonics and were continuing to receive instruction in word recognition skills even during the study. It was not possible to isolate the effects of classroom reading instruction. Hence, classroom instruction may have confounded the results of the study.

All of the one-on-one instructional sessions in this study were conducted by the researcher, and they took place outside of the regular classroom. The study may have had ecological validity if instruction occurred in small groups within the regular classroom, or if it was delivered by the students' regular teacher.

Finally, selection of setting and subjects may have influenced the results. Only those middle schools that agreed to participate were included in the study. Also, only those teachers that were willing to participate, and those students that brought back parent-permission forms were included in the study. A larger sample size with random selection of subjects may have contributed to stronger conclusions about statistical results.

Implications for Practice

The findings of this study have practical implications for teachers and other practitioners that are responsible for designing curriculum and delivering instruction to middle school students who have reading problems. The results of this study indicated that the middle school students who participated in this study were able to benefit from phonological awareness instruction. There was also evidence to show that the students were able to retain their phonological awareness skills over a period of time. The above findings are promising, considering the fact that at the beginning of the study, the students in this sample were far below grade level with respect to phonological awareness skills. The fact that the students were able to demonstrate dramatic improvement shows us that it is worthwhile to incorporate phonological awareness instruction into a regular reading curriculum.

It is crucial for reading teachers at the secondary level to realize the importance of basic skills instruction (e.g., phonological skills instruction) in addition to instruction in comprehension and other higher order skills. To help students make the transfer from phonological awareness skills to word identification, it may be necessary to incorporate letter-sound correspondences as part of the instruction. Teachers may need to invest a lot of time to provide basic skills instruction to every student that has word identification deficits. However, the time would be worth the effort because the instruction would help students to read independently. Consequently, these students would also show improvement in other content areas.

The findings of this study also have implications for preservice teachers and teacher education programs. Those preservice teachers who aspire to teach at the

secondary school level may encounter students with learning disabilities who have severe reading deficits. It is important that teacher education programs sufficiently prepare these teachers to evaluate reading deficits and to design curriculum for students who may have problems in word identification. Teacher educators may need to explain the theoretical basis for including basic skills (e.g., phonological awareness) in a reading program for students with reading deficits. Further, preservice teachers may need intensive training to teach the different phonological awareness skills and to make such training age-appropriate for older students.

In addition to implications for teachers and practitioners, this study also has implications for researchers. Because there are students in the secondary school level that have reading deficits, it is crucial to evaluate and modify remedial instruction. The following section provides directions for future research.

Suggestions for Future Research

Two decades of research has confirmed that phonological awareness plays a critical role in learning to read. Consequently, phonological awareness is becoming a recognized part of beginning instruction. A majority of studies seem to concentrate on elementary school children, probably due to the increased focus on early intervention. Research in education and neurophysiology has asserted that ages between 4 and 7 are crucial for initial reading instruction (e.g., Epstein, 1978). Epstein also proposed that learning during this critical period is more effective than an equivalent amount of learning at some other time. Although early intervention is important, it is also necessary to focus our efforts on those children who may have experienced many years of reading difficulties. However, there is a dearth of research focusing on older students who have

reading difficulties, particularly those who have phonological awareness problems. The purpose of the present study was to contribute to the small body of existing research on older students and to determine if phonological awareness is a viable target for intervention. Though the results of this study are promising, more research is needed before conclusions that link phonological awareness with improved word identification skills in older students can be drawn.

At present, it is clear that phonological awareness consists of many skills, and that they vary in terms of difficulty. Research also suggests that phonological awareness contributes to reading success. However, it is important to investigate how best to achieve the transfer from phonological awareness skills to word recognition for older students.

The review of literature indicated that there were only two experimental studies that involved older students (i.e., Vellutino & Scanlon, 1987; Williams, 1980). Although research suggests that students at the middle school level experience reading difficulties (e.g., Deshler, Warner, Schumaker, & Alley, 1983; Harris & Sipay, 1990), not many studies have attempted to research the effectiveness of phonological awareness to improve word recognition. We need more research involving older students because previous research and the present study suggest that many middle school students who have reading problems also have phonological awareness deficits. The persistence of reading problems well into the middle school level indicates that many students may need intensive intervention that they may not be getting in the classroom. More research involving older students may point to the most appropriate intervention techniques for this age group.

Longitudinal studies involving older students should receive more attention in the future. Though longitudinal studies demand time and resources, this type of research is the only way to evaluate maintenance of skills and transfer of learning. Future research involving older students with reading problems could also be designed to investigate the effectiveness of phonological awareness intervention combined with letter-sound correspondences and word recognition training. Further, the specific skills necessary to bring students with deficits to the level of their high performing peers must be examined. Future research could examine if older students use the same skills as young children do for successful word recognition. Research could also examine if older students with reading problems may perhaps need a different sequence of instruction compared to younger children with reading problems. Evaluating the specific skills that older students use for reading automatically would lead us to examine the theoretical model of reading.

Theoretical Model of Reading

The present study was based on the Adams' (1990) theoretical model of reading. According to the Adams' model (explained in detail in Chapter II), four processors are interrelated during the process of reading: the orthographic processor, the phonological processor, the meaning processor, and the context processor. The model suggests that the orthographic processor takes in visual information from print and the phonological processor is responsible for translating the visual information into sounds. Only after words are correctly identified does comprehension occur. The Adams' model is in agreement with the phonological model explained by Shaywitz (1996) and Snowling (1995). The phonological model also suggests that for words to be recognized, phonological awareness skills must be called into play.

Both models described above are well established and explain the process of reading and the prerequisite skills involved. So far the research that has been done with elementary school children seems to be in agreement with the widely accepted theoretical models of reading. However, we need more research to conclude that the theoretical models can be applied to older students as well. The following questions merit further study: (a) Do older students follow the same reading process as younger children do?, (b) Is the nature of reading deficits in older students the same as it is for younger children?, (c) Can instruction that is designed for young children with reading problems be used for older students with reading problems?, and (d) Would strengthening phonological awareness skills in older students also strengthen word identification skills?

With the existing research on older students, we know that those students who have word recognition problems also have phonological awareness problems. However, we cannot say for sure that the deficits in phonological awareness cause the deficits in word recognition. We need more research in education and other fields (like neurobiology) to establish that older students with reading deficits have the same needs as younger children with deficits do, and that we can safely apply the existing theoretical models to older students. With more research focusing on older students, we may be able to say conclusively that phonological awareness is the answer for reading success.

APPENDIX A
INFORMED CONSENT FORM FOR PARENTS

Dear parents:

My name is Preetha Bhat, and I am a doctoral student at the University of Florida. As part of my doctoral dissertation, I plan to study phonological awareness (an ability that enables students to break words into individual units) intervention with middle school students. The purpose of this study is to facilitate phonological awareness abilities that would enhance word recognition skills. I plan to use a phonological awareness reading program that involves basic skills in phonological awareness. These skills would benefit your child in his/her reading.

I will provide instruction to your child for a total of 6 weeks. I will meet your child 3 days a week for about 10 minutes on each day. Your child will miss about 10 minutes of language arts. In addition to the instruction, I will need to assess your child using the following assessments: (a) Woodcock Reading Mastery Test - Revised and (b) Comprehensive Test of Phonological Processes

I will also need to review your child's cumulative folders for relevant information on reading skills. This information will be used to supplement information from assessment results. There are no risks associated with participation in the study. I will be working under the supervision of Dr. Cynthia C. Griffin and Dr. Paul T. Sindelar from the College of Education, University of Florida. Your child's identity will remain confidential to the extent provided by law. That is, I will not use your child's name in any way. A copy of the results of this study will be available upon request.

Participation or nonparticipation in this study will not affect your child's grade or standings in the classroom. However, we do need your permission for your child to participate in this project. If you should decide to grant permission, please be aware that you, or your child, may withdraw that permission at any time. No compensation will be given for participation. If you have any questions or concerns about this study, you may contact me at 392-0701, ext. 262 or Dr. Griffin at 392-0701, ext. 253. Questions or concerns about research participant's rights may be directed to the UFIRB office, Box 112250, University of Florida, Gainesville, FL 32611-2250; phone: (352) 392-0433.

Sincerely,

Ms. Preetha Bhat

Please return this section to me as soon as possible.

I have read the procedures described above and I give permission for my son/daughter,_____ , to participate in the research study conducted by Preetha Bhat and her supervisors, Dr. Cynthia C. Griffin and Dr. Paul T. Sindelar at the University of Florida. I have received a copy of the description. I have also discussed this project with my child and explained that a person from the University of Florida will be working with him/her.

_____ _____

parent/guardian date

_____ _____

second parent/witness date

APPENDIX B
INSTRUCTIONAL LESSONS

Lesson 1
Selecting the odd one out

Instruction: I am going to say 3 words. I want you to tell me the one word that does not rhyme. For example, if I say, "cat, sat, milk," you would say, "milk," because "milk" does not rhyme with "cat" or "sat."

Practice: Tell me the word that does not rhyme: ball, call dog (dog)
Practice: sale, tea, male (tea)

No.	Instructor says:	Correct response	Score (1, 0)
1	Cap, lap, tall	Tall	
2	Dish, wish, nice	Nice	
3	Find, hand, sand	Find	
4	Sing, draw, ring	Draw	
5	Fast, ride, hide	Fast	
6	Sail, copy, mail	Copy	
7	Hat, balloon, fat	Balloon	
8	Can, late, mate	Can	
9	Chair, fait, table	Table	
10	Sea, tea, water	Water	
11	Glove, handy, candy	Glove	
12	Fall, bone, tone	Fall	
13	Tree, dog, free	Dog	
14	Pop, hop, cat	Cat	
15	Ball, arm, tall	Arm	
16	Sip, lip, pal	Pal	
17	Draw, book, look	Draw	
18	Fall, day, call	Day	
19	Sing, rug, bug	Sing	
20	Find, kind, sad	Sad	
21	Hair, money, fair	Money	
22	Big, fast, last	Big	
23	Bake, make, game	Game	
24	Dress, sun, mess	Sun	
25	Blow, flow, girl	Girl	
26	Face, ten, pen	Face	
27	Puppy, game, lame	Puppy	
28	Rain, main, big	Big	
29	Torn, food, horn	Food	
30	Kind, find, help	help	

Lesson 2
Generating Rhymes

Instruction: I am going to say a word. I want you to tell me a word that rhymes with the word that I say. For example, if I say, "book," you could say, "look," or "cook."

Practice: Tell me a word that rhymes with this word: fin (pin, tin, win)
Practice: Bake (lake, make)

No.	Instructor says:	Correct response	Score (1, 0)
1	Mall	Tall, call, fall	
2	Can	Pan, ran, fan	
3	Bean	Lean, mean, wean	
4	Bee	See, me, knee	
5	Lamp	Damp, camp, ramp	
6	Dish	Wish, fish, swish	
7	Brown	Town, clown, down	
8	Gain	Rain, pain, main	
9	Bunny	Runny, funny, sunny	
10	Candy	Handy, sandy, dandy	
11	Peach	Teach, beach, reach	
12	Told	Fold, mold, old	
13	Name	Tame, same, game	
14	Bell	Sell, tell, fell	
15	Cool	Fool, tool, pool	
16	Get	Bet, pet, yet	
17	Pie	Die, lie, tie	
18	Time	Lime, dime, rhyme	
19	Table	Fable, cable, label	
20	Try	Dry, cry, pry	
21	Crazy	Hazy, lazy, daisy	
22	Hatch	Batch, latch, match	
23	Cash	Rash, mash, hash	
24	Belt	Felt, melt, pelt	
25	Night	Fight, might, light	
26	Round	Bound, found, sound	
27	Drain	Train, brain, grain	
28	Lunch	Bunch, hunch, crunch	
29	Tone	Bone, zone, cone	
30	Bump	Lump, slump, hump	

Lesson 3
Selecting Words With The Same Beginning Sound

Instruction: I am going to say 3 words. I want you to tell me which 2 words have the same beginning sound. For example, if I say, "tent, race, tall," you would say, "tent, tall."

Practice: Tell me the 2 words that have the same beginning sound: nine, save, note (nine, note)
Practice: game, gown, daze (game, gown)

No.	Instructor says:	Correct response	Score (1, 0)
1	Blue, yellow, black	Blue, black	
2	Uncle, son, sister	Son, sister	

No.	Instructor says:	Correct response	Score (1, 0)
3	Make, can, mom	Make, mom	
4	Water, wagon, milk	Water, wagon	
5	Bump, jet, jump	Jet, jump	
6	Pet, bike, balloon	Bike, balloon	
7	Foot, feet, arm	Foot, feet	
8	Nice, purple, party	Purple, party	
9	Kitten, keep, mouse	Kitten, keep	
10	Zipper, zoo, button	Zipper, zoo	
11	Coat, boat, cap	Coat, cap	
12	Six, ten, two	Ten, two	
13	Dog, cow, dad	Dog, dad	
14	Go, get, mow	Go, get	
15	Smile, hat, happy	Hat, happy	
16	Leg, lunch, elbow	Leg, lunch	
17	Nice, door, neck	Nice, neck	
18	About, okay, open	Okay, open	
19	Rich, pick, race	Rich, race	
20	Quit, quiet, kiss	Quit, quiet	
21	Oar, ear, eat	Ear, eat	
22	Bike, bake, fight	Bike, bake	
23	Ugly, quickly, usher	Ugly, usher	
24	Plan, fast, funny	Fast, funny	
25	Very, pail, value	Very, value	
26	Hold, hand, mail	Hold, hand	
27	Yellow, jam, yell	Yellow, yell	
28	Took, gate, gone	Gate, gone	
29	In, ink, way	In, ink	
30	Door, put, pants	Put, pants	

Lesson 4
Selecting A Word With Different Beginning Sound

Instruction: I am going to say 3 words. I want you to tell me which word has a different beginning sound. For example, if I say, "mine, beach, ball," you would say, "mine."

Practice: Tell me the word that has a different beginning sound: rode, fake, fire (rode)
Practice: wing, wash, hang (hang)

No.	Instructor says:	Correct response	Score (1, 0)
1	Bun, liver, boy	Liver	
2	Card, carrot, funny	Funny	
3	Pizza, burger, pan	Burger	
4	Only, again, alone	Only	
5	Day, dinner, big	Big	
6	Hood, which, when	Hood	
7	Trip, vacation, track	Vacation	
8	Supper, soup, meat	Meat	
9	Hot, church, chill	Hot	
10	Make, cash, moon	Cash	
11	Night, no, mail	Mail	
12	Gift, like, live	Gift	

No.	Instructor says:	Correct response	Score (1, 0)
13	Garden, girl, jet	Jet	
14	Open, under, over	Under	
15	Day, ball, born	Day	
16	Fur, fence, laid	Laid	
17	Holiday, warm, handy	Warm	
18	Even, around, about	Even	
19	Want, nail, winter	Nail	
20	Jam, jet, kiss	Kiss	
21	Fear, near, night	Fear	
22	Mother, most, farmer	Farmer	
23	Clean, chip, clay	Chip	
24	Pray, green, great	Pray	
25	Call, calm, good	Good	
26	Shape, clap, ship	Clap	
27	Zip, zoom, some	Some	
28	Leap, plan, plow	Leap	
29	Brake, drip, brown	Drip	
30	Fresh, trash, trip	fresh	

Lesson 5
Selecting Words With The Same Final Sound

Instruction: I am going to say 3 words. I want you to tell which 2 words have the same final sound. For example, if I say, "boat, seed, hat," you would say, "boat, hat."

Practice: Tell me which 2 words have the same final sound: fad, load, fax (fad, load)
Practice: leaf, seem, farm (seem, farm)

No.	Instructor says:	Correct response	Score (1, 0)
1	Run, rap, sun	Run, sun	
2	Wider, dog, colder	Wider, colder	
3	Hawk, look, nest	Hawk, look	
4	Friend, tall, pill	Tall, pill	
5	Food, good, fries	Food, good	
6	Chair, seat, belt	Seat, belt	
7	Candy, sweet, tardy	Candy, tardy	
8	Hello, radio, greet	Hello, radio	
9	Wolf, fox, ox	Fox, ox	
10	Box, egg, bag	Egg, bag	
11	Hands, arms, head	Hands, arms	
12	Cap, teeth, lip	Cap, lip	
13	House, calf, roof	Calf, roof	
14	Boom, mom, boot	Boom, mom	
15	Kitchen, puppy, happy	Puppy, happy	
16	Rib, lab, hurt	Rib, lab	
17	Drum, horn, slam	Drum, slam	
18	Few, six, fox	Six, fox	
19	Torn, truck, barn	Torn, barn	
20	Music, school, tell	School, tell	
21	Mush, fish, blow	Mush, fish	
22	Tree, knee, head	Tree, knee	
23	Tramp, find, jump	Tramp, jump	

No.	Instructor says:	Correct response	Score (1, 0)
24	Water, brag, snug	Brag, snug	
25	Blast, rush, flash	Rush, flash	
26	Jazz, fizz, trick	Jazz, fizz	
27	Soda, see, beta	Soda, beta	
28	Back, pick, board	Back, pick	
29	Latch, weather, church	Latch, church	
30	Window, first, last	First, last	

Lesson 6
Selecting a word with a different final sound

Instruction: I am going to say 3 words. I want you to tell me which word has a different final sound. For example, if I say, "bat, time, coat," you would say, "time."

Practice: Tell me the word that has a different final sound: trip, fan, moan (trip)
Practice: cut, bit, tab (tab)

No.	Instructor says:	Correct response	Score (1, 0)
1	Rib, sub, milk	Milk	
2	Plant, cat, seed	Seed	
3	Map, sun, soon	Map	
4	Pop, foot, tap	Foot	
5	Bunch, school, lunch	School	
6	Pull, wish, hash	Pull	
7	Trust, first, third	Third	
8	Barn, beam, farm	Barn	
9	Knee, water, bee	Water	
10	Sod, pad, lip	Lip	
11	Bag, rub, dig	Rub	
12	Shoe, path, mouth	Shoe	
13	Truck, pack, kind	Kind	
14	Bingo, music, radio	Music	
15	Game, fin, pan	Game	
16	Bad, wrap, said	Wrap	
17	Beef, cuff, treat	Treat	
18	Collar, grow, follow	Collar	
19	Fuss, play, pass	Play	
20	Crib, slam, broom	Crib	
21	Leak, book, laugh	Laugh	
22	Leap, bean, trap	Bean	
23	Poster, after, ready	Ready	
24	Plan, nook, been	Nook	
25	Color, hang, ring	Color	
26	Rich, gray, patch	Gray	
27	Bake, mouth, cloth	Bake	
28	Jab, slab, trip	Trip	
29	Finally, faster, quickly	Faster	
30	Today, tango, halo	today	

Lesson 7
Selecting Beginning, Middle, Or Ending Sound Of A Word

Instruction: I am going to say a word. I want you to tell me the beginning, middle, or ending sound of the word. For example, if I say, "Tell me the beginning sound of "jump," you would say /j/"

Practice: Tell me the beginning sound of "down" (/d/)
Practice: middle sound in "beet" (/ee/)
Practice: ending sound in "look" (/k/)

No.	Instructor says:	Correct response	Score (1, 0)
1	Beginning sound in time	/t/	
2	Beginning sound in hair	/h/	
3	Beginning sound in gate	/g/	
4	Beginning sound in sun	/s/	
5	Beginning sound in chart	/ch/	
6	Middle sound in coat	/o/	
7	Middle sound in that	/a/	
8	Middle sound in dot	/o/	
9	Middle sound in time	/i/	
10	Middle sound in run	/u/	
11	Ending sound in bump	/p/	
12	Ending sound in hide	/d/	
13	Ending sound in tree	/ee/	
14	Ending sound in bag	/g/	
15	Ending sound in tell	/l/	
16	Beginning sound in jet	/j/	
17	Beginning sound in kite	/k/	
18	Beginning sound in eat	/ee/	
19	Beginning sound in beach	/b/	
20	Beginning sound in thick	/th/	
21	Middle sound in rap	/a/	
22	Middle sound in pet	/e/	
23	Middle sound in sick	/i/	
24	Middle sound in fit	/i/	
25	Middle sound in but	/u/	
26	Ending sound in hello	/o/	
27	Ending sound in quit	/t/	
28	Ending sound in puff	/f/	
29	Ending sound in biker	/r/	
30	Ending sound in kiss	/s/	

Lesson 8
Blending Two Words To Make A New Word

Instruction: I am going to say 2 words. I want you to put them together to make one word. For example, if I say, "butter, fly," you would say, "butterfly."

Practice: I want you to put these words together: sea, weed (sea-weed)
Practice: witch, craft (witch-craft)

No.	Instructor says:	Correct response	Score (1, 0)
1	Play, house	Play-house	
2	Butter, milk	Butter-milk	
3	Cheese, cake	Cheese-cake	
4	After, noon	Afternoon	
5	Horse, play	Horse-play	
6	Nursing, home	Nursing-home	
7	School, day	School-day	
8	Week, end	Weekend	
9	Hand, some	Handsome	
10	Rain, coat	Rain-coat	
11	Week, day	Week-day	
12	Shoe, string	Shoe-string	
13	Ear, ring	Ear-ring	
14	Snow, man	Snow-man	
15	Table, top	Table-top	
16	Ear, muff	Ear-muff	
17	Shoe, lace	Shoe-lace	
18	Micro, wave	Microwave	
19	Sun, day	Sunday	
20	Snow, storm	Snow-storm	
21	Kit, kat	Kit-kat	
22	Sand, wich	Sandwich	
23	Whole, some	Wholesome	
24	Rail, road	Rail-road	
25	Police, man	Policeman	
26	High, way	Highway	
27	Man, hole	Manhole	
28	Tap, dance	Tap-dance	
29	Day, time	Daytime	
30	Light, bulb	Light-bulb	

Lesson 9
Blending Syllables

Instruction: I am going to say 2 parts of a word. I want you to put them together to make a whole word. For example, if I say, "sum-mer," you would say, "summer."

Practice: Put together these 2 word parts: sis - ter (sister)
Practice: ta - ble (table)

No.	Instructor says:	Correct response	Score (1, 0)
1	Hap-py	Happy	
2	Cir-cus	Circus	
3	Fun-ny	Funny	
4	Feel-ing	Feeling	
5	Bod-y	Body	
6	Mo-tor	Motor	
7	Un-der	Under	
8	Pa-per	Paper	
9	Win-dow	Window	
10	Ti-ger	tiger	
11	Birth-day	Birthday	

No.	Instructor says:	Correct response	Score (1, 0)
12	Par-ty	Party	
13	Sil-ly	Silly	
14	Wa-ter	Water	
15	Yel-low	Yellow	
16	Pur-ple	Purple	
17	Lit-tle	Little	
18	Rock-et	Rocket	
19	In-to	Into	
20	Be-hind	Behind	
21	Ap-ple	Apple	
22	Ev-er	Ever	
23	Fin-ger	Finger	
24	Dad-dy	Daddy	
25	Bas-ket	Basket	
26	Han-dy	Handy	
27	Kit-chen	Kitchen	
28	Mon-key	Monkey	
29	Neigh-bor	Neighbor	
30	Pic-nic	Picnic	

Lesson 10
Blending Phonemes (sounds)

Instruction: I am going to say some sounds. I want you to put them together to make a word. For example, if I say, "/p/ /a/ /n/," you would say, "pan."

Practice: /c/ /a/ /p/ (cap)

No.	Instructor says:	Correct response	Score (1, 0)
1	/h/ /a/ /t/	Hat	
2	/m/ /i/ /d/	mid	
3	/m/ /a/ /n/	Man	
4	/t/ /o/ /p/	Top	
5	/m/ /a/ /p/	Map	
6	/p/ /i/ /l/	Pill	
7	/g/ /e/ /t/	Get	
8	/r/ /e/ /d/	Red	
9	/d/ /o/ /t/	Dot	
10	/k/ /i/ /t/	Kit	
11	/g/ /o/ /t/	Got	
12	/k/ /o/ /n/	Cone	
13	/sh/ /i/ /p/	Ship	
14	/g/ /o/ /n/	Gone	
15	/f/ /a/ /t/	Fat	
16	/a/ /t/	At	
17	/i/ /t/	It	
18	/o/ /f/	Of	
19	/a/ /m/	Am	
20	/i/ /n/	In	
21	/l/ /o/ /t/	Lot	
22	/m/ /a/ /p/	Map	

No.	Instructor says:	Correct response	Score (1, 0)
23	/sh/ /o/ /p/	Shop	
24	/f/ /o/ /g/	Fog	
25	/f/ /a/ /n/	Fan	
26	/f/ /l/ /a/ /t/	Flat	
27	/l/ /a/ /m/ /p/	Lamp	
28	/p/ /a/ /n/ /t/	Pant	
29	/l/ /o/ /s/ /t/	Lost	
30	/c/ /l/ /a/ /m/	Clam	

Lesson 11
Segmenting Words

Instruction: I am going to say a word. I want you to break the word into 2 words. For example, if I say, "buttermilk," you would say, "better, milk."

Practice: Break this word into 2 parts: homeroom (home, room)
Practice: toothpick (tooth, pick)

No.	Instructor says:	Correct response	Score (1, 0)
1	Bus-stop	Bus, stop	
2	Silver-ware	Silver, ware	
3	Tea-pot	Tea, pot	
4	Cook-book	Cook, book	
5	Grape-juice	Grape, juice	
6	Pineapple	Pine, apple	
7	Storybook	Story, book	
8	Book-shelf	Book, shelf	
9	Back-door	Back, door	
10	Ice-cream	Ice, cream	
11	Swim-suit	Swim, suit	
12	Key-board	Key, board	
13	Back-yard	Back, yard	
14	Bear-hug	Bear, hug	
15	Table-top	Table, top	
16	Ear-muff	Ear, muff	
17	Shoe-lace	Show, lace	
18	Microwave	Micro, wave	
19	Sunday	Sun, day	
20	Snow-storm	Snow, storm	
21	Kitkat	Kit, kat	
22	Sandwich	Sand, wich	
23	Wholesome	Whole, some	
24	Rail-road	Rail, road	
25	Policeman	Police, man	
26	Highway	High, way	
27	Manhole	Man, hole	
28	Tap-dance	Tap, dance	
29	Daytime	Day, time	
30	Light-bulb	Light, bulb	

Lesson 12
Segmenting Words into Syllables

Instruction: I am going to say a word. I want you to break the word into smaller parts. For example, if I say, "summer," you would say, "sum, mer."

Practice: Break this word into smaller parts: butter (but, ter)
Practice: hospital (hos, pi, tal)

No.	Instructor says:	Correct response	Score (1, 0)
1	Apple	Ap, ple	
2	Master	Mas, ter	
3	Foreign	For, eign	
4	Chicken	Chick, en	
5	Table	Tab, le	
6	Regal	Re, gal	
7	Classic	Class, ic	
8	Termite	Ter, mite	
9	Kitchen	Kit, chen	
10	Sweater	Sweat, er	
11	Sandal	San, dal	
12	Pencil	Pen, cil	
13	Building	Build, ing	
14	Stereo	Ste, reo	
15	Basket	Bas, ket	
16	Multiply	Mul, ti, ply	
17	Library	Lib, ra, ry	
18	Division	Di, vi, sion	
19	Classical	Classi, cal	
20	Computer	Com, pu, ter	
21	Formica	For, mi, ca	
22	Aerobics	Ae, ro, bics	
23	Cinema	Ci, ne, ma	
24	Instructor	In, struc, tor	
25	Provided	Pro, vi, ded	
26	Simplify	Sim, pli, fy	
27	Charity	Cha, ri, ty	
28	Halloween	Hall, o, ween	
29	Africa	Af, ri, ca	
30	Conversation	Con, ver, sa, tion	

Lesson 13
Segmenting Words into Phonemes

Instruction: I am going to say a word. I want you to tell me each sound in the word. For example, if I say, "jot," you would say, "/j/ /o/ /t/."

Practice: Tell me all the sounds in the word, "bike." (/b/ /i/ /k/)
Practice: "name" (/n/ /a/ /m/)

No.	Instructor says:	Correct response	Score (1, 0)
1	Rip	/r/ /i/ /p/	
2	Joke	/j/ /o/ /k/	
3	Man	/m/ /a/ /n/	
4	Bet	/b/ /e/ /t/	
5	Kite	/k/ /i/ /t/	
6	Sun	/s/ /u/ /n/	
7	Pet	/p/ /e/ /t/	
8	Jam	/j/ /a/ /m/	
9	Bob	/b/ /o/ /b/	
10	Am	/a/ /m/	
11	It	/i/ /t/	
12	Tune	/t/ /u/ /n/	
13	At	/a/ /t/	
14	Me	/m/ /ee/	
15	Hop	/h/ /o/ /p/	
16	Eve	/ee/ /v/	
17	Of	/o/ /f/	
18	Bath	/b/ /aa/ /th/	
19	Leg	/l/ /e/ /g/	
20	Wag	/w/ /a/ /g/	
21	Why	/wh/ /i/	
22	Seem	/s/ /ee/ /m/	
23	Hush	/h/ /u/ /sh/	
24	Note	/n/ /o/ /t/	
25	Up	/u/ /p/	
26	Chin	/ch/ /i/ /n/	
27	Crime	/cr/ /i/ /m/	
28	Doll	/d/ /o/ /l/	
29	Truck	/tr/ /u/ /k/	
30	drape	/dr /a/ /p/	

Lesson 14
Saying A Word With A Part Or Beginning Sound Missing

Instruction: I am going to ask you to say a word without saying a certain part of the word. For example, if I say, "Say 'cat' without saying /c/," you would say, "at."

Practice: Say "grandmother" without saying "grand" (mother)
Practice: "jam" without saying /j/ (am)

No.	Instructor says:	Correct response	Score (1, 0)
1	Seashell without shell	Sea	
2	Baseball without ball	Base	
3	Toothpaste without tooth	Paste	
4	Fit without /f/	It	
5	Bookshelf without book	Shelf	
6	Landslide without slide	Land	
7	Skyline without line	Sky	
8	Boardwalk without walk	Board	
9	Mad without /m/	Ad	
10	Sand without /s/	And	

No.	Instructor says:	Correct response	Score (1, 0)
11	Cup without /c/	Up	
12	Dog without /d/	Og	
13	Mall without /m/	All	
14	Bun without /b/	Un	
15	Vale without /v/	Ale	
16	Everything without every	Thing	
17	Afternoon without noon	After	
18	Butterfly without butter	Fly	
19	Goldfish without fish	Gold	
20	Sunshine without shine	Sun	
21	Outside without out	Side	
22	Fireman without fire	Man	
23	Pink without /p/	Ink	
24	Get without /g/	Et	
25	Queen without /qu/	Een	
26	Zip without /z/	Ip	
27	Smile without /s/	Mile	
28	Jump without /j/	Ump	
29	Open without /o/	Pen	
30	Make without /m/	ake	

Lesson 15
Saying A Word With A Final Or Middle Sound Missing

Instruction: I am going to ask you to say a word without saying the ending sound or middle sound of a word. For example, if I say, "Say 'lost' without saying /t/," you would say, "los."

Practice: Say "left" without saying /t/ (lef)
Practice: "next" without /x/ (net)

No.	Instructor says:	Correct response	Score (1, 0)
1	Cart without saying /t/	Car	
2	Mood without /d/	Moo	
3	Hawk without /k/	Haw	
4	Pizza without /a/	Pizz	
5	Summer without /er/	Summ	
6	Pants without /s/	Pant	
7	Slant without /t/	Slan	
8	Winter without /t/	Winner	
9	Driver without /v/	Drier	
10	Fast without /s/	Fat	
11	Monkey without /k/	Money	
12	Bobcat without /c/	Bobat	
13	Bowling without /l/	Bowing	
14	Jump without /m/	Jup	
15	Gently without /t/	Genly	
16	Ranch without /ch/	Ran	
17	Hand without /d/	Han	
18	Lamp without /l/	Amp	
19	Beef without /f/	Bee	
20	Slump without /p/	Slum	

No.	Instructor says:	Correct response	Score (1, 0)
21	Seam without /m/	Sea	
22	Piano without /o/	Pian	
23	Best without /s/	Bet	
24	After without /t/	Afer	
25	Stamp without /m/	Stap	
26	Black without /l/	Back	
27	Past without /s/	Pat	
28	Grass without /r/	Gass	
29	Left without /f/	Let	
30	Snap without /n/	sap	

Lesson 16
Phoneme Reversal

Instruction: I am going to say a word. I want you to reverse the order of two sounds and say the new word. For example, for the word, "top" I want you to switch places for /t/ and /p/. So you would tell me, "pot."

Practice: For "pat" switch places for /p/ and /t/ (tap)
Practice: For "tim" switch places for /m/ and /t/ (mit)

No.	Instructor says:	Correct response	Score (1, 0)
1	For "kit" switch places for /k/ and /t/	Tik	
2	For "leaf" switch places for /l/ and /f/	Feel	
3	For "bus" switch places for /b/ and /s/	Sub	
4	For "tip" switch places for /t/ and /p/	Pit	
5	For "nod" switch places for /n/ and /d/	Don	
6	For "nip" switch places for /n/ and /p/	Pin	
7	For "loot" switch places for /l/ and /t/	Tool	
8	For "doom" switch places for /d/ and /m/	Mood	
9	For "teem" switch places for /t/ and /m/	Meet	
10	For "sot" switch places for /s/ and /t/	Tos	
11	For "tin" switch places for /t/ and /n/	Nit	
12	For "neet" switch places for /n/ and /t/	Teen	
13	For "tub" switch places for /t/ and /b/	But	
14	For "tab" switch places for /t/ and /b/	Bat	
15	For "dab" switch places for /d/ and /b/	Bad	
16	For "bid" switch places for /b/ and /d/	Dib	
17	For "dim" switch places for /d/ and /m/	mid	
18	For "tag" switch places for /t/ and /g/	Gat	
19	For "mole" switch places for /m/ and /l/	Lome	
20	For "bin" switch places for /b/ and /n/	Nib	
21	For "pots" switch places for /p/ and /t/	Tops	
22	For "ten" switch places for /t/ and /n/	Net	
23	For "nog" switch places for /n/ and /g/	Gon	
24	For "mil" switch places for /m/ and /l/	Lim	
25	For "file" switch places for /f/ and /l/	Life	
26	For "tame" switch places for /t/ and /m/	Mate	
27	For "late" switch places for /l/ and /t/	Tale	
28	For "fits" switch places for /f/ and /t/	Tifs	
29	For "mad" switch places for /m/ and /d/	Dam	
30	For "mope" switch places for /m/ and /p/	pome	

Lesson 17
Phoneme Substitution

Instruction: I am going to say a word. I want you to remove one sound from that word and replace it with another sound and then say the new word. For example, if I say, "Say 'pit,' now remove the /p/ sound and put in /l/, you would say, 'lit'."

Practice: Say "mite." Now instead of /m/ say /k/ and say the new word. (kite)
Practice: Say "fat." Instead of the /f/ sound say /s/. (sat)

No.	Instructor says:	Correct response	Score (1, 0)
1	Say 'mouse.' Instead of /m/ say /h/	House	
2	Say 'bend.' Instead of /b/ say /l/	Lend	
3	Say 'meet.' Instead of /m/ say /b/	Beet	
4	Say 'sub.' Instead of /s/ say /t/	Tub	
5	Say 'caps.' Instead of /k/ say /l/	Laps	
6	Say 'crib.' Instead of /i/ say /a/	Crab	
7	Say 'fib.' Instead of /i/ say /a/	Fab	
8	Say 'log.' Instead of /o/ say /e/	Leg	
9	Say 'lift.' Instead of /i/ say /o/	Loft	
10	Say 'nose.' Instead of /s/ say /t/	Note	
11	Say 'dog.' Instead of /g/ say /t/	Dot	
12	Say 'lip.' Instead of /p/ say /t/	Lit	
13	Say 'rat.' Instead of /t/ say /p/	Rap	
14	Say 'pam.' Instead of /m/ say /d/	Pad	
15	Say 'cot.' Instead of /t/ say /p/	Cop	
16	Say 'bone.' Instead of /b/ say /l/	Lone	
17	Say 'sing.' Instead of /s/ say /p/	Ping	
18	Say 'tall.' Instead of /t/ say /b/	Ball	
19	Say 'nest.' Instead of /n/ say /p/	Pest	
20	Say 'fun.' Instead of /f/ say /g/	Gun	
21	Say 'pent.' Instead of /n/ say /s/	Pest	
22	Say 'list.' Instead of /s/ say /n/	Lint	
23	Say 'gate.' Instead of /t/ say /p/	Gape	
24	Say 'mite.' Instead of /t/ say /l/	Mile	
25	Say 'soda.' Instead of /d/ say /f/	Sofa	
26	Say 'hit.' Instead of /t/ say /m/	Him	
27	Say 'sup.' Instead of /p/ say /n/	Sun	
28	Say 'fig.' Instead of /g/ say /t/	Fit	
29	Say 'pit.' Instead of /t/ say /n/	Pin	
30	Say 'flat.' Instead of /t/ say /p/	flap	

Review

Selecting The Odd One Out

Instruction: I am going to say 3 words. I want you to tell me the one word that does not rhyme.

Instructor says:	*Correct response*	*Score*
Fast, peel, last	Peel	
Men, pen, hat	Hat	
Leg, gone, peg	Gone	

Instructor says:	*Correct response*	*Score*
Egg, book, look	Egg	
Sweet, mice, lice	Sweet	

Generating Rhymes

Instruction: I am going to say a word. I want you to tell me a word that rhymes with the word that I say.

Instructor says	*Correct response*	*Score*
Can	Man, pan, tan	
Hand	Land, sand	
Made	Fade, paid	
Red	Fed, bed	
phone	Moan, lone, tone	

Selecting Words With The Same Beginning Sound

Instruction: I am going to say 3 words. I want you to tell me which 2 words have the same beginning sound.

Instructor says	*Correct response*	*Score*
Hand, house, let	Hand, house	
Care, fake, carrot	Care, carrot	
Lime, dog, lake	Lime, lake	
Sun, pen, sweet	Sun, sweet	
Take, give, tin	Take, tin	

Selecting A Word With Different Beginning Sound

Instruction: I am going to say 3 words. I want you to tell me which word has a different beginning sound.

Instructor says	*Correct response*	*Score*
Mine, kite, make	Kite	
Shoe, lake, ship	Lake	
Fin, gone, fat	Gone	
Night, road, never	Road	
Chair, door, chin	Door	

Selecting Words With The Same Final Sound

Instruction: I am going to say 3 words. I want you to tell me which 2 words have the same final sound.

Instructor says	*Correct response*	*Score*
Drum, horn, slam	Drum, slam	
Sun, fight, fun	Sun, fun	
Hello, greet, radio	Hello, radio	
Glass, point, moss	Glass, moss	
Cola, broad, soda	Cola, soda	

Selecting A Word With A Different Final Sound

Instruction: I am going to say 3 words. I want you to tell me which word has a different final sound.

Instructor says	*Correct response*	*Score*
Jello, gift, radio	Gift	
Fuss, play, grass	Play	
Finally, week, quickly	Week	
Bag, kind, leg	Kind	
Seed, rabbit, deed	Rabbit	

Selecting The Beginning Sound Of A Word

Instruction: I am going to say a word. I want you to tell me the beginning sound of the word.

Instructor says	*Correct response*	*Score*
Feather	/f/	
Cassette	/c/	

Instructor says:	*Correct response*	*Score*
Chair	/ch/	
Twister	/t/	
Penguin	/p/	

Selecting The Middle Sound Of A Word

Instruction: I am going to say a word. I want you to tell me the middle sound of the word.

Instructor says	*Correct response*	*Score*
Fun	/u/	
bag	/a/	
Tide	/d/	
Led	/e/	
mite	/i/	

Selecting The Ending Sound Of A Word

Instruction: I am going to say a word. I want you to tell me the ending sound of the word.

Instructor says	*Correct response*	*Score*
Grass	/s/	
Door	/r/	
Hand	/d/	
Gun	/n/	
fresh	/sh/	

Blending Two Words To Make One Word

Instruction: I am going to say 2 words. I want you to put them together to make one word.

Instructor says	*Correct response*	*Score*
Bus, stop	Bus-stop	
Week, end	Weekend	
Shoe, string	Shoe-string	
Key, board	Key-board	
Ear, ring	Ear-ring	

Blending Syllables

Instruction: I am going to say 2 parts of a word. I want you to put them together to make a whole word.

Instructor says	*Correct response*	*Score*
Don-key	Donkey	
Or-ange	Orange	
Bas-ket	Basket	
Pub-lic	Public	
Walk-ing	Walking	

Blending Phonemes

Instruction: I am going to say some sounds. I want you to put the sounds together to make a word.

Instructor says	*Correct response*	*Score*
/b/ /a/ /g/	Bag	
/t/ /i/ /p/	Tip	
/l/ /o/ /t/	Lot	
/s/ /l/ /a/ /m/	Slam	
/f/ /a/ /n/	Fan	

Segmenting Words

Instruction: I am going to say a word. I want you to break the word into 2 words.

Instructor says	*Correct response*	*Score*
Policeman	Police, man	
Bubble-gum	Bubble, gum	

Instructor says:	*Correct response*	*Score*
Milk-shake	Milk, shake	
Ice-cream	Ice, cream	
Light-bulb	Light, bulb	

Segmenting Words Into Syllables

Instruction: I am going to say a word. I want you to break the word into smaller parts.

Instructor says	*Correct response*	*Score*
Multiply	Mul, ti, ply	
Ceramic	Ce, ra, mic	
Future	Fu, ture	
Department	De, part, ment	
Gator	Ga, tor	

Segmenting Words Into Phonemes

Instruction: I am going to say a word. I want you to tell me each sound in the word.

Instructor says	*Correct response*	*Score*
Frog	/f/ /r/ /o/ /g/	
Sup	/s/ /u/ /p/	
Nog	/n/ /o/ /g/	
Fan	/f/ /a/ /n/	
Pest	/p/ /e/ /s/ /t/	

Saying A Word With A Part Of Beginning Sound Missing

Instruction: I am going to ask you to say a word without saying a certain part of the word.

Instructor says	*Correct response*	*Score*
Say lit without /l/	It	
Keel without /k/	Eel	
Pant without /p/	Ant	
Glass without /g/	Lass	
Fade without /f/	Ade	

Selecting A Word With A Final Or Middle Sound Missing

Instruction: I am going to ask you to say a word without saying the ending sound or middle sound.

Instructor says	*Correct response*	*Score*
Load without /l/	Oad	
Leaf without /f/	Lee	
Wind without /d/	Win	
Fast without /s/	Fat	
Dent without /n/	Det	

Phoneme Reversal

Instruction: I am going to say a word. I want you to reverse the order of 2 sounds and say the new word.

Instructor says	*Correct response*	*Score*
For lip switch places for /l/ and /p/	Pil	
For nib switch places for /n/ and /b/	Bin	
For pat switch places for /p/ and /t/	Tap	
For mit switch places for /m/ and /t/	Tim	
For mid switch places for /m/ and /d/	mid	

Phoneme Substitution

Instruction: I am going to say a word. I want you to remove one sound from that word and replace it with another sound and say the new word.

Instructor says	*Correct response*	*Score*
Say 'pam.' Instead of /p/ say /s/	Sam	

Instructor says:	*Correct response*	*Score*
Say 'feather.' Instead of /f/ say /h/	Heather	
Say 'leg.' Instead of /g/ say /t/	Let	
Say 'hit.' Instead of /i/ say /o/	Hot	
Say 'flat." Instead of /a/ say /i/	Flit	

APPENDIX C
LESSON SCORE SHEET

Name:
Group:
School:
Grade:

Item	Lesson #																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
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26																		
27																		
28																		
29																		
30																		

APPENDIX D
MEAN SCORES ON THE CTOPP SUBTESTS

Group A	CTOPP Subtests	Pretest	Midtest	Posttest
	Elision	9.7	14.4	14.55
	Blending words	10.55	14.05	13.9
	Nonword repetition	11.65	13	13.05
	Blending nonwords	10.45	13.8	13.9
	Segmenting words	9.65	13.85	13.6
	Segmenting nonwords	7.8	13.25	12.9
	Phoneme reversal	7.56	12.3	12.3
Group B	CTOPP Subtests	Pretest	Midtest	Posttest
	Elision	9.55	9.9	14.8
	Blending words	10.8	10.85	14.5
	Nonword repetition	11.1	11	14.95
	Blending nonwords	9.55	9.85	13.15
	Segmenting words	8.65	9.05	13.8
	Segmenting nonwords	7.45	8.8	12.85
	Phoneme reversal	6.65	8.4	12.6

APPENDIX E

NUMBER OF ADMINISTRATIONS FOR EACH LESSON FOR GROUPS A AND B

A	Lessons																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1	1	2	2	1	2	1	1	1	2	1	1	3	1	3	3	3
2	1	1	1	2	2	2	1	1	1	2	1	1	2	1	3	3	3
3	1	1	1	1	2	3	2	1	1	1	1	1	2	2	2	3	3
4	2	1	2	1	3	3	1	1	1	3	1	2	2	2	2	3	3
5	1	1	2	1	1	2	2	1	1	2	1	1	3	1	3	3	3
6	1	2	1	2	2	2	2	2	1	2	1	2	3	1	3	3	3
7	1	1	2	2	1	3	1	1	1	2	1	1	3	2	3	3	3
8	1	1	1	1	1	2	2	1	1	1	1	1	3	2	3	3	3
9	1	1	2	2	2	2	1	1	1	2	1	1	2	2	3	2	3
10	1	2	1	2	2	2	2	1	1	2	2	2	2	2	3	2	3
11	1	1	1	1	3	2	2	1	1	2	1	1	2	1	2	3	2
12	1	1	2	1	2	2	1	1	1	3	1	1	3	1	2	3	3
13	1	1	1	1	1	2	2	1	1	2	1	1	2	1	3	3	3
14	1	2	2	2	3	3	2	1	1	3	1	2	2	2	3	2	3
15	1	1	1	2	2	2	2	1	1	2	2	1	2	2	2	3	3
16	1	1	1	1	1	3	1	1	1	2	1	1	3	2	3	3	3
17	1	1	2	2	2	3	2	1	1	2	1	1	2	1	3	3	3
18	1	1	1	2	2	2	2	1	1	3	1	1	2	1	2	3	3
19	1	1	2	1	1	2	2	1	1	2	1	1	2	2	3	3	3
20	1	1	1	2	2	2	2	1	1	2	1	2	2	2	3	3	2

B	Lessons																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2	3	3
2	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2	3	3
3	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3
4	1	1	1	1	2	1	1	1	1	2	1	1	3	2	3	3	3
5	1	1	1	2	1	2	2	1	1	2	1	2	2	3	3	3	2
6	1	2	1	1	1	2	1	1	1	2	1	1	2	2	3	2	3
7	1	1	1	1	1	1	2	1	1	1	1	1	3	2	3	3	3
8	1	1	1	1	1	1	2	1	1	1	1	1	2	2	3	3	3
9	1	1	2	1	1	1	1	1	1	3	1	2	2	2	3	3	3
10	1	1	1	1	1	2	1	1	1	2	1	1	2	2	2	3	3
11	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	3	3
12	1	1	1	1	1	1	2	1	1	1	1	1	2	2	2	3	3
13	1	1	1	1	1	2	1	1	1	2	1	1	2	2	3	3	3
14	1	1	1	2	1	1	2	1	1	2	2	1	2	2	3	2	2
15	1	2	2	1	2	1	2	1	1	2	1	2	3	3	3	3	3
16	1	1	1	1	1	1	1	1	1	3	1	1	2	3	2	3	3
17	1	1	1	1	1	2	2	1	1	2	1	1	3	3	3	2	3

B	Lessons																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	1	2	1	1	1	1	2	1	1	2	1	1	3	3	3	3	3
19	1	2	1	1	2	2	1	1	1	2	1	1	2	3	2	3	3
20	1	1	2	2	1	1	2	1	1	2	1	2	3	3	3	3	3

APPENDIX F
SCORES ON EACH LESSON FOR GROUPS A AND B

A	Lessons																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	27	27	21 25	20 25	26	23 25	27	29	27	24 25	27	28	17 19 25	27	17 20 25	14 19 25	18 19 25
2	25	27	26	22 26	23 25	24 26	27	29	28	24 27	26	28	24 25	26	16 19 25	17 21 26	10 18 25
3	26	29	25	25	24 26	23 24 26	24 27	27	28	26	26	27	23 26	24 25	24 26	19 22 26	15 19 26
4	24 25	28	20 25	25	22 24 25	24 24 26	25	28	25	18 22 25	25	19 25	19 25	24 26	19 25	16 19 25	20 21 25
5	28	27	21 26	26	25	24 25	24 27	25	26	21 25	28	25	20 22 25	27	20 22 25	20 21 25	10 19 25
6	25	23 25	27	21 25	24 25	23 26	24 29	24 28	26	19 25	27	21 26	21 22 25	28	21 21 25	20 22 26	9 19 25
7	26	25	24 26	22 27	26	22 24 26	26	26	25	22 25	25	26	22 23 25	21 26	22 24 26	20 20 25	11 21 25
8	25	29	26		25	22 25	21 25	27	29	25	26	26	19 21 26	21 25	20 21 25	17 19 25	13 20 25
9	27	29	23 26	24 26	24 25	24 26	25	27	27	20 25	28	26	22 26	23 27	21 22 26	21 25	14 19 25
10	25	24 27	25	24 25	23 26	24 27	22 25	28	26	19 25	19 25	22 25	22 25	24 27	21 24 27	17 25	15 18 25
11	26	27	25	26	23 23 25	23 25	24 28	28	25	22 26	26	27	23 26	28	19 25	20 23 26	17 25
12	28	28	21 25	27	23 25	23 26	26	25	28	19 23 25	27	25	19 21 25	27	20 25	14 20 25	20 23 26
13	28	29	27	25	27	24 26	19 25	25	29	21 25	25	25	24 27	27	19 22 25	11 20 25	18 19 25
14	28	22 26	22 25	23 26	23 24 26	23 24 26	20 25	26	28	21 23 25	27	21 26	24 26	21 25	20 24 25	19 25	17 20 25
15	25	28	25	24 27	24 25	22 26	22 26	27	26	20 25	24 27	26	24 27	22 26	21 26	19 23 25	14 20 25
16	26	27	26	27	26	19 21 25	25	26	27	20 25	26	25	18 20 25	22 27	21 24 26	17 19 25	10 21 25

A	Lessons															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
17	29	28	20 25	24 25	24 26	20 21 25	19 25	25	28	21 26	28	27	21 25	26	23 22 25	10 19 25	9 19 25
18	25	27	26	24 27	23 25	22 26	24 28	29	27	17 20 25	25	27	24 26	26	22 26	20 22 26	19 21 25
19	26	29	21 26	27	26	24 25	23 25	27	26	21 25	26	27	23 25	23 26	20 21 25	18 21 25	17 20 25
20	27	29	28	22 26	24 27	19 25	22 26	26	26	24 27	26	21 25	19 25	24 26	23 23 25	19 23 26	18 26

B	Lessons																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	25	26	28	25	25	28	25	26	27	18 25	25	26	23 27	22 25	18 25	10 19 25	11 19 25
2	26	26	26	25	26	25	26	27	27	22 27	26	25	24 25	23 27	20 26	12 20 26	14 19 25
3	25	28	26	27	27	26	26	25	25	25	26	25	24 27	22 25	21 25	20 22 25	18 22 26
4	27	27	27	26	22 25	26	28	25	26	21 25	27	27	17 20 25	24 25	15 20 26	19 24 25	17 24 25
5	26	25	25	22 25	28	18 25	21 26	28	26	21 26	27	21 25	20 26	16 20 26	14 21 25	17 20 25	10 20 25
6	25	21 26	26	26	27	21 27	28	26	28	24 26	28	26	23 26	24 27	17 19 25	20 25	11 22 26
7	28	25	28	26	27	26	22 25	25	26	26	25	27	24 27	21 25	20 21 25	19 17 25	12 21 25
8	29	26	28	28	28	27	23 26	28	25	25	26	27	21 25	19 25	20 22 26	20 21 25	15 23 25
9	25	25	23 27	27	27	27	27	25	25	21 22 25	26	23 26	22 27	23 26	13 20 25	19 20 25	16 19 25
10	26	27	26	27	26	23 27	28	25	26	24 28	27	26	23 26	23 25	21 26	20 22 26	17 19 25
11	20 25	27	25	23 28	23 27	28	24 25	26	27	23 25	27	27	22 28	25	23 25	17 20 26	19 21 25
12	27	26	26	29	26	27	24 27	29	29	25	25	28	21 25	24 26	24 25	10 19 25	20 22 26
13	25	25	27	26	29	24 25	27	26	28	24 27	28	28	19 26	24 28	15 20 26	11 19 26	21 22 25

B	Lessons																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
14	26	25	26	21 25	28	26	20 25	25	25	21 25	22 25	26	21 28	20 25	11 19 26	19 25	12 20 26
15	26	22 27	22 26	25	21 26	26	24 28	25	26	20 25	25	24 25	18 22 26	15 19 25	16 21 25	19 23 26	14 19 26
16	28	28	27	25	25	27	27	27	27	22 26	25	25	24 25	16 20 25	21 27	15 21 25	17 19 25
17	25	26	27	27	26	24 27	19 25	28	28	22 28	26	26	18 21 25	20 22 26	20 22 25	20 25	16 21 26
18	27	20 25	25	27	27	28	24 28	29	25	21 25	26	27	20 21 25	22 24 26	22 24 25	17 19 26	18 21 26
19	27	19 25	26	28	22 28	24 28	28	29	25	24 29	25	28	23 28	21 23 25	19 25	19 20 26	20 24 25
20	26	25	24 25	19 26	28	27	21 25	27	26	24 27	28	24 27	22 23 27	21 22 25	20 24 25	21 22 25	13 21 25

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BIOGRAPHICAL SKETCH

Preetha Bhat was born in Kerala, India, and grew up in Madras, India. Her undergraduate and master's degree were in psychology. After completing her master's degree, Preetha taught in a special school in Madras, India. This school was specially designed for children with disabilities. Preetha's responsibilities included providing instruction and conducting assessments (including IQ, achievement tests, and personality tests). Working with children who had learning problems led Preetha to pursue her doctoral degree in the field of special education. Consequently, she applied to various universities in the U.S. and was accepted in the University of Florida.

In the future, Preetha plans to continue research on learning disabilities with a special emphasis on reading and reading problems. Her other areas of interest include legal issues with respect to children with reading problems, learning strategies, neuropsychological aspects of learning disabilities, and classroom management. She also plans to teach undergraduate classes at Moorhead State University, Minnesota.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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Professor of Special Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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